



List of U.S. Army Research Institute Research and Technical Publications



October 1, 1989, to September 30, 1994

With Author and Subject Index



**United States Army Research Institute
for the Behavioral and Social Sciences**

February 1995

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U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction
of the Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Director

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5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600**

**Office, Deputy Chief of Staff for Personnel
Department of the Army**

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Foreword

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is the Army's agency for behavioral and social science research. Independent laboratories and supporting operational research units working together provide a flexible research program on personnel utilization, training and evaluation, leadership and management, simulation systems, manpower and education systems, human factors in systems integration, state-of-the-art computer technology, and information sciences research for the modern Army.

ARI reports the findings of its research and investigations in its own series of publications. The number of these publications and the wide range of subjects they cover make the kind of list and indexes presented in this publication both necessary and valuable.

EDGAR M. JOHNSON
Director

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List of U.S. Army Research Institute Research and Technical Publications

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Introduction

The primary responsibility of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is to maximize soldier effectiveness. ARI accomplishes its mission through research and development in the acquisition, training, utilization, and retention of Army personnel. ARI research and products affect every Army mission with a human performance component.

As convenient references for qualified agencies and individuals and sponsors, ARI publishes lists of its technical and research publications. This issue of the publication list describes reports published during the period October 1, 1989, to September 30, 1994. It contains the abstract of each publication and the bibliographic information needed to identify a publication. The abstracts have been written, as far as possible, to describe the principal research findings in nontechnical terms; however, technical language is used to communicate efficiently the details of research analysis. Author and subject indexing provides access to individual reports and topics.

This publication supplements the 44-year list of ARI publications issued from October 1, 1940, to September 30, 1983; the list of publication abstracts issued annually from October 1, 1958, to September 30, 1983; the 7-year list of publications issued from October 1, 1980, to September 30, 1986; the

4-year list of publications issued from January 1, 1986, to September 30, 1989; and the annual lists of publications issued from October 1, 1989, to September 30, 1990; October 1, 1990, to September 30, 1991; October 1, 1991, to September 30, 1992; October 1, 1992, to September 30, 1993.

ARI Publications

ARI publications are divided into separate, consecutively numbered categories appropriate to their intended audience and function. During fiscal years 1990-94, the following types of research and technical reports were issued by ARI:

Research Note (RN). An interim or final report typically of limited interest outside of ARI. It is filed with the Defense Technical Information Center (DTIC) but is not printed. Research Notes usually fall into one of the following categories:

- An inhouse report that is of limited interest outside of ARI but is considered worth submitting to DTIC to be part of the Department of Defense (DoD) archive of technical documentation.
- An interim contract report that is of limited interest outside of ARI but is considered worth submitting to DTIC to be part of the DoD archive of technical documentation.

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- A final contract report that is of limited interest outside of ARI but must be submitted to DTIC in accordance with Department of the Army regulations to close a contract.
- Material related to a Research Report or Technical Report (detailed tables, graphs, charts, sample forms, and sample training and testing materials) published as a Research Note to economize on printing and distribution.

Research Product (RP). A user-oriented report intended to aid Army personnel. Examples are handbooks, manuals, and guidebooks.

Research Report (RR). A report of completed research intended primarily for dissemination to military managers.

Research Reports may deal with policy-related issues but typically do not include specific policy recommendations.

Study Note (SN). A Study Note may contain or consist of —technical text, computer code, diskettes or tapes with software, databases, codebooks or other documentation, raw data, data collection instruments, figures, tables, or any other products that do not concisely convey the import of a project but which must be archived for technical completeness.

Study Report (SR). A published report briefly documenting studies and analyses.

Technical Report (TR). A report of completed research intended primarily for dissemination to researchers.

Research Reports and Technical Reports published by the U.S. Army Research Institute for the Behavioral and Social Sciences are intended for sponsors of research and development (R&D) tasks and

for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or memorandum.

ARI Distribution

Initial distribution of these publications was made directly by ARI. Research Reports, Technical Reports, and Research Products were distributed primarily to operational and research facilities and their sponsors in DoD, to other interested Government agencies, and to DTIC; copies of some reports were also sent to the Library of Congress for distribution to libraries participating in the Documents Expediting Project. Research Notes were deposited with DTIC but were not published.

These publications are *NOT* available from ARI. DoD agencies and contractors can purchase paper copies or microfiche from—

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Other Government agencies and the general public can obtain unclassified reports from—

U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

NOTE: When requesting copies of these reports, use the DTIC accession number (AD _____) appearing in parentheses following the date of publication of each citation.

Research Notes

RN 90-01 Review of Light Infantry Doctrine, Lambert, G.G.; Shaneyfelt, S.E. December 1989. (AD A215 919) This document represents a current literature review of light infantry doctrine. It is an essential step in our current research effort to identify light infantry training and doctrine shortcomings, prioritize research issues, and develop research solutions to light infantry training and doctrine problems.

RN 90-02 Canceled.

RN 90-03 The Effects of Amount of M1 Unit Conduct-of-Fire Trainer (U-COFT) Transition Training on Crew, Campshire, D.A.; Witmer, B.G.; Drucker, E.H. January 1990. (AD A219 924) This research examined the effects of three types of variables on crew M1 Unit Conduct-of-Fire (U-COFT) gunnery proficiency during transition training: time spent training on the M1 U-COFT, soldier-based variables (e.g., time with partner, time in armor), and training-based variables (e.g., classroom hours, time spent on the M60A3 U-COFT). The reliability of gunnery proficiency test was also assessed. Three groups of TC-gunner teams were tested after having completed 3, 6, or 9 hours of transition training on the M1 U-COFT. Time spent on the U-COFT resulted in improved gunnery performance on only one of seven criterion measures— average miss distance. Since this was the most sensitive measure of gunnery performance, the results suggest that learning may have taken place despite the failure to detect performance improvements on six of the seven criterion measures. Although the three groups differed significantly on a number of training-based variables, only the number of exercises completed in the TC training matrix had an effect on any of the performance measures. The reliability of all of the cri-

terion measures exceeded 0.50, with the reliability of two measures exceeding 0.70.

RN 90-04 Evaluation of an Engineering Copier for Command Post Use, Riedel, S.L. February 1990. (AD A221 354) This report documents the methods, results, and recommendations of the evaluation of a large-item copier for use in Army garrison and field command posts. Army command posts need to reproduce large items such as maps and overlays. A copier that can reproduce these items would eliminate the need for hand copying. For the evaluation, one copier was used in a division garrison command post for 6 weeks and three were used in brigade and battalion command posts during a national Training Center rotation. Evaluation data were collected by means of use logs and post-exercise interviews with the users and copier repairmen. In the field, problems included mechanical failure of all three copiers, difficulty moving the copier because of its weight, the requirement that the copier must be level in order to print, and developer spillage during moving. If these problems can be alleviated, use of the copier is recommended for the field. In garrison, these problems did not occur frequently. However, garrison users reported a 3% vertical displacement of the copied material. Garrison users recommended use of the copier for their operations despite the stretching.

RN 90-05 Application of Computers To Learning in the Command and General Staff College: CGSC Analysis, Thorn, C.T. February 1990. (AD A220 570) A front-end analysis was conducted to study the possibilities of expanding the use of computers in instruction at the United States Army Command and General Staff College (CGSC). The CGSC is organized in five schools, one of which, Command and General

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Staff School (CGSS), is not formally established. The schools provide instruction to commissioned and noncommissioned officers and civilians through 4 primary courses and approximately 20 short courses. The primary courses are CAS3 (Combined Arms and Services Staff School) Phase I Nonresident Course, CAS3 Phase II Resident Course, CGSOC (Command and General Staff Officers Course), and SAMS (School of Advanced Military Studies). The shorter courses are primarily provided through SPD (School for Professional Development). This report presents the results of analysis of organization and cognitive level in the primary courses to provide the project team sufficient understanding of the College and enable careful consideration of the application of computers to learning in a subsequent task. Numerous opportunities for the integration of computers into the curricula were identified. This report presents the findings and recommendations of Task A of the Front-end analysis. Related reports are separately bound. The reports all have the beginning title, "Application of Computers to Learning in the Command and General Staff College." The headings for the other reports are as follows:

- A Front-end Analysis Study
- Analysis of Staff Officer Knowledge, Skills, and Abilities
- Assessment of Computers in Education at various Institutions
- Technology Assessment
- Assessment of Computer Literacy in CGSC
- Analysis of Institutional and Financial Constraints
- Army Command and Control Concepts Study
- Comparison of Knowledge, Skills, and Abilities to CGSC Learning Objectives
- Identification of Computer Opportunities

RN 90-06 Directorate for Information Management User Survey,
Hunter, D.R. February 1990. (AD A219 970)

This report summarizes the findings of a survey of military and civilian employees of the U.S. Army Aviation Systems Command and the U.S. Army Troop Support Command. The survey was conducted to assess the products and services of the Directorate for Information Management, Information Systems Command, St. Louis, MO. Approximately 700 employees completed a questionnaire organized to correspond to the major functional areas of the Directorate for Information Management. The results showed that employees frequently used the products and services, found them to be important to the conduct of their jobs, and were generally satisfied with what they were receiving. Analyses of several of the major functional areas and all questionnaire items are reproduced in an appendix. It is recommended that the results of the survey be used to prioritize efforts to improve products and services and that the survey be readministered periodically to assess improvement.

RN 90-07 Early MPT Estimation Methods: An Evaluation of the LHX Test-Bed Research Program, Volumes I and II, Horizons Technology, Inc. February 1990. (AD A223 076) The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has been a major sponsor of research efforts to develop MANPRINT methods. This report describes a program initiated in early 1985 that focused on the development and testing of analytic and predictive MANPRINT-manpower requirements methods. Since the program used LHX acquisition data in methodology development, a second goal was to apply prototype products in support of the LHX Program Manager efforts to analyze LHX manpower requirements. The total effort resulted in seven interrelated projects, including the development of three software tools—the Transition Training model, the Electronic Aids to Maintenance (EAM) model, and the Manpower and Mission Capability (MANCAP) model. The Transition Training model is

a scheduling tool that estimates the training resources required and average unit readiness downtime given a particular unit training schedule. The EAM is a spreadsheet-based Administrative and Logistics Delay Time model that incorporates potential BIT failures in the failure and repair sequence, allowing for the examination of the impact of EAM performance deficiencies on LHX aircraft availability. The MANCAP model is a computer-based model that estimates mission capability of a weapon system based upon weapon system characteristics, operating organization characteristics, and mission performance profiles. The full report is incorporated in two volumes. The first provides a review of the seven project activities and results and discusses lessons learned that can be relevant to future MANPRINT methodology development efforts. the second volume presents copies of the three software models/tools developed under this effort and instructions for their use.

RN 90-08 Human Performance Data Relevant to the Armored Family of Vehicles, O'Keefe, T.J.; Henriksen, K.; Barber, J.L. February 1990. (AD A225 122) For this report, human performance findings and issues relevant to the Armor Family of Vehicles (AFV) were abstracted from past literature in the areas of encapsulation, information processing, continuous operation, and maintenance. Emphasis was placed on selecting documents that contain quantitative data and information easily generalizable to the AFV soldier and tasks. Implications for the design, training, and manpower requirements for the AFV were developed from the documents. The report is organized to provide varying levels of detail required by personnel involved with AFV MANPRINT issues. The detailed findings and implications for each of the four areas were placed in a hardcopy database (Appendix C) and summarized in narrative form in the results section. Material useful for briefing purposes is located in Appendix

B. Sections can be used separately or as part of the whole, depending on the user's need.

RN 90-09 Evaluation Plan for the Gateway 2000 Demonstration Project, Hunter, D.R.; Lewis, H.V. February 1990. (AD A221 784) The Gateway 2000 Demonstration Project is designed to show that an important determinant of effective personnel management is managerial capacity to elicit employee involvement in mission accomplishment. To ascertain the validity of the project's premise, an external contractor will conduct a multiyear assessment of the effectiveness of the demonstration project interventions instituted in three major areas of personnel management: (1) classification and compensation; (training and employee development; and (3) performance evaluation and employee recognition. The United States Army Aviation Systems Command and the United States Army Troop Support command located at the Federal center in St. Louis, Missouri, will participate in the demonstration project. Located near Detroit, Michigan, the United States Army tank and Automotive Command will serve as project control and will receive no project interventions. The evaluation plan specifies the minimum requirements for assessment of the 5-year demonstration project and provides other information pertinent to conducting the project evaluation.

RN 90-10 Identification of Crew- and Platoon-Level Gunnery Sub-tasks: Objectives for a Threat-Based Training Program, Morrison, J.E.; Meade, G.A.; Campbell, R.C. February 1990. (AD A219 918) The purpose of this report was to develop and apply methods for identifying training objectives for threat engagement scenarios derived in previous research (R. Campbell and C. Campbell, 1989; Doyle, 1989). Rational methods were used to identify a list of crew- and platoon-level subtasks to serve as training objectives. A review against existing

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task documentation revealed that the list was a comprehensive collection of gunnery behaviors. Cluster analyses reduced the numerous crew-level subtasks to eight categories that differed with respect to fidelity requirements, functional subgoal, and skill requirements. These subtask categories were named (a) Manipulation of Gun Controls, (b) Tank Commander Engagement Control Procedures, (c) Target Acquisition, (d) Immediate Action, (e) Switch Setting Procedures, (f) Fire Commands/Reports, (g) Degraded Modes, and (h) Maneuver Tank. Cross-indexing of subtasks to threat engagement scenarios in which they might be trained revealed a difference between individual/crew and collective subtasks: While most individual and crew could subtasks could be trained in all or nearly all threat engagement scenarios, most collective subtasks were associated with some but not other scenarios. The researchers concluded that the threat scenario conditions were important drivers for collective subtasks, whereas nonthreat conditions (e.g., hardware conditions) were more important for determining whether individual and crew subtasks could be trained.

RN 90-11 Course of Action Assessment

Tool (COAAT) Software De-

scription , Ross, C.G. February 1990.

(AD A220 017) This report describes the software of the Course of Action Assessment Tool (COAAT). COAAT is a computerized aid for assisting tactical operations officers in the assessment of various courses of action (COA). COAAT assists the analysts in organizing critical events (CE) according to his chosen method for analyzing the battlefield, analyzing the detailed actions of each COA, and summarizing and comparing the results so the preferred COA may be identified. COAAT is written in Common Lisp for Symbolics computers operating under Genera 7.2. COAAT was conceived and developed as a prototype for a field operating system. It is configured

for operation in the laboratory environment of EDDIC (Experimental Development, Demonstration, and Integration Center) at the Army Research Institute Field Unit, Fort Leavenworth, Kansas. Although the current version of COAAT is not an artificial intelligence (AI) application, exercises using COAAT may reveal opportunities for the application of AI techniques.

RN 90-12 Short Range Air Defense (SHORAD) Engagement Performance Criteria, Drewfs, P.R.; Barber, A.V. February 1990. (AD A221 020) This report presents and discusses the development, administration, and calibration of standards for qualification of Short Range Air Defense (SHORAD) operators. The objective is to develop range tables that the U.S. Army Air Defense Artillery School (USAADASCH) can use to determine the proficiency level of air defense soldiers for training and qualification. A review of the air defense literature and recent air defense empirical data was conducted. As a result of this review, air defense scenarios, scenario difficulty factors and weights, summary and task performance measures, performance scoring algorithms, performance feedback displays, air defense criteria cutoffs, and performance criteria test administration procedures and test conditions were developed. A preliminary examination of the scenarios, the difficulty indexes, and the criteria was conducted using field test data obtained during this effort using the Realistic Air Defense Engagement System (RADES), a SHORAD testbed and trainer. The preliminary performance standards will be subjected to a series of validation tests to ensure their representativeness and to further calibrate them according to scenario difficulty level.

RN 90-13 Two Howitzer Crew Drill Models , Bolin, S.F.; Nicholson, N.R.;

Smootz, E.R. February 1990. (AD A221 169) For this research, Micro SAINT soft-

ware (Micro Analysis and Design, Inc.) was used to build crew drill models to develop a modeling and simulation approach to weapon system evaluation that could be used to supplement evaluation procedures. The intent was to link crew performance directly to system performance. Two models were developed for the Howitzer Improvement Program. Exercising the models over a range of critical task error rates produced results that illustrated how average performance time may degrade very slowly despite errors in selected tasks. It was concluded that crew drill models written in Micro SAINT offer a promising way to assist operational testing and evaluation.

RN 90-14 Manpower and Personnel Integration (MANPRINT): Some Preliminary Observations and Lessons Learned, Schendel, J.D.; Johnson, K.M.; Riviello, R.N. March 1990. (AD A219 971) This report offers preliminary observations and lessons learned as a result of direct participation in and work accomplished under the MANPRINT program. The report provides a historical perspective on the continuing evolution of the MANPRINT program and outlines some considerations for improving the program.

RN 90-15 Investigating Family Adaptation to Army Life: Exploratory Site Visit Findings, Styles, M.B.; Janofsky, B.J.; Blankinship, D.A.; Bishop, S. March 1990. (AD A219 968) The purpose of this research was to collect information about family adaptation to Army life. Interviews and focus group discussions were held with 184 participants (i.e., 51 leaders, 28 service providers, and 105 soldiers and spouses). A subsample of soldiers and their spouses also completed a coping resource checklist. The results indicate that families are most concerned about those aspects of Army life that affect their ability to function on a day-to-day basis. Issues of concern are medical care, housing, child care,

work hours, moves, and separations. Participants reported that Army leadership must demonstrate an interest and concern for families and they expressed the opinion that the Army wants to retain families that adjust well to Army life. Also, the participants indicated that family adaptation can directly affect readiness and retention.

RN 90-16 Improving Re-Enlistment Through Decision Making Modeling and Intervention, Sullivan, W.P.; Bartlett, T.E. March 1990. (AD A221 108) Fifty-nine Grenada veterans currently assigned to the 82nd Airborne Division and the 1st and 2nd Battalions of the 75th Ranger Regiment rank ordered twenty-five factors in order of their importance in contributing to the success of operation Urgent Fury. The data were analyzed using the Objective Judgment Quotient (OJQ*) analysis system developed by Wyvern Research Associates. The results showed that Grenada veterans attributed their eventual success in Grenada to Personnel Factors such as teamwork, small unit leadership, and physical conditioning. Equipment and hardware performed adequately, while those factors relating to Intelligence Information and Interservice Communications were very little help in overall success of the operation.

RN 90-17 Career Decision-Making and the Military Family: Toward a Comprehensive Model, Croan, G.M.; Bowen, G.L.; Farkas, G.; Glickman, A.; Orthner, D.K.; Nogami, G.Y.; Gade, P.A.; Tremble, T.R. March 1990. (AD A223 225) This report summarizes the findings of a panel of scientists convened to develop a conceptual framework for guiding research on the relationship between retention and Army family issues. Literature was reviewed in five domains important in retention decision-making: economic factors, job-related factors, and family, community, and organizational culture. Based on these reviews, a retention decision-making

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model incorporating all domains was proposed. This publication presents a preliminary model of the career/retention decision-making process. In addition to the effect of job factors, the impact of family concerns and processes on retention and career decision-making is explored. Five retention and family issues are identified and discussed in detail: economics and retention, job factors and retention, family factors and retention, community variables and retention/turnover, and organizational culture and retention. The comprehensive model of family retention decision-making is based on information from these five areas. The proposed model provides direction to family and retention research. It is the first comprehensive model of retention as both an outcome and a process. The Army needs to have a process model of the family career/retention decision-making process to find ways to encourage the best soldiers and their families to make the Army a career.

RN 90-18 Spouse Employment: First Annual In Process Review, Research Triangle Institute. April 1990.

(AD A223 730) This report presents a series of briefing slides issues, activities, and plans concerning the spouse employment research area of the Army Family Research Program (AFRP). Topics covered include policy and research questions, the spouse employment conceptual model, activities and findings to date, and planned activities. The report concludes with a summary of outstanding issues.

RN 90-19 Army Family Research Program: First Meeting of the Scientific Advisory Committee, Segal, M.W. April 1990. (AD A222 441) The report of the first meeting of the Scientific Advisory Committee (SAC) includes a summary of the committee's comments on the Five-Year Research Plan and individual reports from three of the committee—Philip Bobko, Walter Schumm, and Richard Berk. The SAC summary incorpo-

rates comments on the committee's mandate, the project's choice of research priorities, and the scientific community's suggestions on research perspectives for readiness, retention, family adaption, and spouse employment, the key focus of the Army Research Program. In addition, the report outlines some methodological issues for the project to consider in completing the planned research. Foremost among these issues are longitudinal versus cross-sectional data collection strategies, qualitative versus quantitative methods, and linear versus expected curvilinear and interactive effects.

RN 90-20 Family Adaptation: Second Annual In Process Review, Caliber

Associates. April 1990. (AD A223 260) This report covers the progress and plans for the Research Area #1 (Family Adaptation) of the Army Family Program. The report highlights three areas of research: (1) the family adaptation model and measures, (2) developmental research (products and findings), and (3) the planned core extension research designed to address installation leadership practices, family adaption to relocation, and family adaptation to separation.

RN 90-21 The Impact of Military Life on Spouse Labor Force Outcomes,

Schwartz, J.B.; Wood, L.; Griffith, J.D. April 1990. (AD A224 934) This paper examines those military and non-military factors which determine Army wives' labor force participation, employment, and level of employment. The research is based on the 1985 DoD Member and Spouse survey data. The framework for the study is the household utility model which assumes that a woman's choice of whether and how much to participate in the labor force is a function of her market wage, her reservation wage, her personal tastes and preferences. Profit analyses were performed on three separate equations which estimated probabilities of any Army spouse's employ-

ment (v. non-employment), her full-time work (v. part-time work), and her employment in a job which uses her skills (v. underemployment). Further simulations estimated probable changes in employment patterns with a CONUS (vs. OCONUS) location, the presence of an installation-level spouse employment program, increased levels of spouse education or soldier tour length.

RN 90-22 Army Family Policies and Practices: A Summary of Regulations, Letters, Pamphlets, and Circulars That Impact on Army Families, Tankersley, M.; Coolbaugh, K.; Barokas, J. May 1990. (AD A223 265) This report on Army policies and practices lists and abstracts those Army policies that affect Army families. In addition, the report summarizes selected Army Regulations (ARs), DA Pamphlets (DA PAMs), and Training Circulars (TCs) and categorizes them according to their impact on Army families. The five impact categories used in this report are relocation, community service networks, spouse employment, and family support.

RN 90-23 The Army Family Research Program: Second Meeting of the Scientific Advisory Committee, Segal, M.W. May 1990. (AD A222 442) This report of the second meeting of the Scientific Advisory Committee (SAC) includes a summary of the committee's comments on the Army Family Research Program's (AFRP) revised Research Plan and individual reports from two members of the committee, Janice Madden and George Levinger. The SAC summary incorporates an overall critique of the Research Plan and specific comments on several major areas. The specific areas of concern to the SAC were the following: (1) setting priorities among research components, (2) testing the research model, (3) developing theory, testable interventions, and practical policy recommendations for readiness, retention, family adap-

tation, and spouse employment, and (4) balancing the demands for the quantitative and qualitative portions of research.

RN 90-24 Learning Morse Code Characters: A Replication of the Keller Method, Westerman, D.A.; Ramsay, D.A. May 1990. (AD A222 438) This Research Note describes a study conducted as part of a larger project to improve the training of Morse code intercept skills. The study was a partial replication of the "code-voice" method developed for initial character training by Keller and his associates during World War II. The method was carried out with nine subjects. Results showed that this training method continues to be of value in initial character learning of Morse code, and that seemingly small modifications to the procedure can have substantial effects on the rate of acquisition.

RN 90-25 Family Factors and Retention: First Annual In Process Review, Research Triangle Institute. May 1990. (AD A224 934) This report presents a series of briefing slides on research issues, activities, and plans concerning the retention research area of the Army Family Research Program (AFRP). Topics covered include policy and research questions, the retention conceptual model, activities and findings to date, and planned activities. The report concludes with a summary of outstanding issues.

RN 90-26 Results of the Analysis of the Army Community Service Family Member Employment Assistance Program: CONUS Sites, Perrine, H.S. May 1990. (AD A222 439) This report presents a briefing of the status of the Army Community Service (ACS) Family Member Employment Assistance Programs (FMEAP) in CONUS. An overview of the presence of FMEAPs by MACOM is exhibited, along with a more detailed focus by on-post media and off-post community outreach campaigns. Collaborations between

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the Civilian Personnel Office (CPO) and FMEAP are detailed. Suggestions for HQDA marketing assistance are listed and ranked.

RN 90-27 Family Factors and Retention: Second Annual In Process Review, Research Triangle Institute. May 1990. (AD A222 440) This report summarizes the developmental work and progress of the Task 2 area (Retention) of the Army Family Research Program (AFRP). The report overviews the major activities, modeling, and retention research hypotheses to be tested as part of the AFRP. The report concludes with the research area organization and staff responsibilities.

RN 90-28 An Experimental Evaluation of the Cueing Procedures Used With the Pilot's Line-of-Sight Reticle, Weeter, R.D.; McAnulty, D.M. June 1990. (AD A224 935) Three experiments were conducted to evaluate the cueing procedure for the copilot-gunner's (CPG) line-of-sight (LOS) symbol in the AH-64A pilot night vision system. The location of the CPG, or Cued, LOS is indicated by dots positioned on imaginary axes extending from the arms (0° , 90° , 180° , 270°) of the pilot's LOS reticle. The procedure uses either one- or two-dot cues to indicate one of eight search areas for locating the CPG LOS. The cueing dots also flash when the pilot must boresight the integrated helmet and display sight subsystem (IHADSS). The three experiments used a selective visual attention paradigm. Experiment 1 evaluated the effects of the number of cueing elements and the presentation duration on the accurate perception of the cues. Experiment 2 compared the effectiveness of the one- and two-dot cues in locating a fixed target. Experiment 2 also evaluated the effects of presentation duration and practice on target identification accuracy. Experiment 3 evaluated the effect of the secondary meaning (boresight required) on the accuracy of target identification under the dot, duration, and practice conditions. The results of the three experiments led to four recommenda-

tions for possible design options, training considerations, or further research: (1) redesign the Cued LOS procedure to create equally effective cues for all portions of the field of regard, (2) develop a different method for indicating an IHADSS boresight requirement, (3) provide extensive practice in using the cueing procedure, and (4) advise the pilots to ensure they are interpreting the cue accurately before beginning a search for the Cued LOS.

RN 90-29 Instructor Certification Materials and Observation Instruments for Dragon Weapon Training, Lucciariello, G.; Dyer, J.L.; Purvis, J.W. June 1990. (AD A225 218) For this report, an experiment was conducted to evaluate the feasibility and effectiveness of a Dragon weapons instructor certification program. The Dragon is a portable, medium-range, antitank weapon system. For the experimental certification program, instructor training and assessment materials were developed and observation instruments were generated to record student behavior and proficiency and the content delivered and instructional design principles used by the instructors. The certification materials, observation forms, and a summary of the results are in the report. The certification program was successful in changing student behavior on three of the five tasks for which instructor training materials were developed. No changes occurred on the five control tasks. Data from the observation forms showed that desired changes in instructor behavior were more likely on the experimental than on the control tasks.

RN 90-30 Arithmetic Skills in Using Algorithms, Lichtenstein, S.; MacGregor, D. June 1990. (AD A226 272) An algorithm is a series of steps or operations that when sequentially applied, produces a solution to a problem. Properly applied, algorithms are helpful when a complex or difficult numerical question can be broken into

subquestions. This paper identifies and details a serious barrier to the effective use of algorithms: weak mathematical skills. Given an algorithm of 13 steps requiring copying, converting from percentages to proportions, adding, subtracting, multiplying, and dividing, 78 percent of our subjects made one or more errors in the task. These results suggest that decision aids be tested on the population for which they were intended, to avoid problems arising from unexpected deficits in users' knowledge and skills.

RN 90-31 Retrieval of Knowledge Through Algorithmic Decomposition, Lichtenstein, S. June 1990.

(AD A225 667) This report summarizes the results of a series of studies to evaluate the effectiveness of algorithms for estimating unknown quantities. The results of the first experiment show that, as the structure of the aid increases, the subjects' performance improves in terms of both accuracy and consistency across subjects. The second experiment, however, suggests that algorithms used without understanding are of limited help. Further experiments suggest substantial problems in designing decision aids based on algorithmic decomposition, not because the principles of creating algorithms are hard to learn but because the users may be misled by their own misinformation and lack of arithmetic skills. These findings lead us to believe that such decision aids should be used in situations where algorithms can be carefully and deliberately designed and computational aids are also available. Possible approaches are suggested for the design of an expert system using algorithmic decomposition.

RN 90-32 Factual Knowledge of Oregon College Students, Lichtenstein, S. June 1990. (AD A225 412) This paper explores the usefulness of algorithmic decomposition in estimating uncertain quantities. In a series of experiments, experimental questions were used that people are unlikely to know

the precise answer to, but could estimate from other facts or estimates. The three studies conducted indicate that the subjects who volunteer for our experiments frequently lack knowledge of basic facts. A mild manipulation intended to persuade the subjects to reevaluate and improve their estimates had little effect. The data further suggest that efforts to develop estimation aids based on algorithmic decomposition techniques may fail, not because people are unable to make such decompositions but because they have and hold extensive stores of misinformation. When this misinformation is brought to bear on estimation problems, performance may not improve but become worse than previously expected.

RN 90-33 Creating Algorithms as an Aid to Judgment, Lichtenstein, S.; MacGregor, D.; Slovic, P. June 1990.

(AD A225 580) The strategy for aiding judgment presented in this report is algorithmic decomposition. To use this approach, a complicated or unknown quantity is decomposed into a number of subproblems that are more manageable or can be estimated more readily. Answers to the component parts of the problem are then combined according to a set of rules (an algorithm) to yield an answer to the original problem. In this experiment we gave subjects questions concerning facts they would be unlikely to know but could estimate and provided subjects with a wrong answer. The subjects' task was to decide whether the given wrong answer was too high or too low. After completing four such items, subjects were given tutorials on how to create algorithms, based on facts they knew or could estimate, to help them in their task. They then completed four more items under instructions to write an algorithm for each one. These efforts to teach subjects to create their own algorithms were successful in the sense that most subjects were able to write algorithms for the questions we gave them. However, the increase in accuracy of their decisions as a result of creat-

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ing and using algorithms, from 65% to 69%, was only marginally significant and unimpressive in size.

RN 90-34 Creating Algorithms as an Aid to Judgment: Part II, Lichtenstein, S.; Weathers, A.G. June 1990.

(AD A225 698) Previous research has shown that subjects improve their performance in estimating unknown quantities when they are asked to write algorithms about these quantities. These algorithms are short combination rules whereby the subjects decompose the unknown quantities into a series of other quantities that they can more easily estimate and then use these estimates to arrive at an estimate of the requested quantity. This paper extends this research by exploring the effectiveness of asking subjects to work the algorithm they create not once, but twice, first using low estimates for the component parts and again using high estimates for the component parts. The study shows that subjects can be trained to create algorithms, but that the use of algorithms does not improve their performance to any great degree. When successful, the technique of creating an algorithm and using it to make two estimates led to very accurate performance (93% correct). But the technique also badly misled subjects on some occasions, bringing down the overall performance.

RN 90-35 Research on Complex Decision Making, Knowledge Representation, and the Transfer of Existing Systems to ARI, Pask, G. July 1990. (AD A225 447)

This report briefly describes the results of a program of research that focused on the conversion of a new technology into a form that is facile and generally transferable using a network of microprocessors. When the contract was awarded, the choice (at that time a very reasonable choice) of hardware was the 8-bit microprocessor and (standard to ARI and other institutions) the Apple II microprocessor, augmented by standard peripheral equip-

ment. The program suites, appropriate to these machines and a Corvus 20 megabyte disc, have been delivered, as originally specified. Now it is true that a 16- or 32-bit technology would have been a better choice since obvious limitations and difficulties crop up with smaller address space. However, the networking paradigm remains viable and may only be replaced by a multitasking system with very sophisticated display and control capabilities to exhibit the power of the systems to any user and render the computing organization transparent, as is required. The deliverables noted are CASTE (Course Assembly System and Tutorial Environment), THOUGHTSTICKER, and the Team Decision System (TDS), together with manually and computer-administered versions of a test for learning innovative and conceptual style, SPC2. In addition, documentation, source code, and various other documents have been delivered. While the program emphasized the transfer of a rendered-translatable-technology, it encouraged the dissemination of knowledge and further research. Both of these objectives have been satisfied to the extent required in the Annexes to this report.

RN 90-36 Enhancing Performance Under Stress by Information About Its Expected Duration 2nd Annual Report, Breznitz, S. July 1990.

(AD A225 899) For this report, the effect of False short and False Long Information (with subsequent correction) on endurance of the Cold Pressor Test (CPT) was studied using more extreme information manipulations than the ones tested during the first year. On the basis of a specific experiment that investigated hand effects and order effects in the CPT paradigm, it was possible to use a combined between- and within-subjects design. Endurance in the False Short condition was significantly higher than in the False Long one. In another experiment, most subjects endured pain longer in the No Control than in

the Control conditions. The implications of these results to military situations were discussed. A pilot field experiment with marching soldiers tested some of the above factors in a real-life military context. False Long information at the start of the march led to significant breakdown under the strain.

RN 90-37 Further Research on Headings in Text, Hartley, J. July 1990.

(AD A221 511) This research presents the results of two experiments designed to complement the seven experiments reported earlier (The effects of heading in text). The present experiment examined the effects of different kinds of heading in different positions. The results indicated that headings aided recall, search and retrieval, but the kind and the position of the heading had no significant effect. A further three replication studies were then carried out, utilizing a different text, and a different population of readers. Headings were found to aid search and retrieval but not recall in these studies. Finally two more experiments are described which examined the effects of type of heading with less able respondents. These experiments utilized both texts with the older age groups. There were no significant interactions between the kind of heading and the ability of the participants in either experiment.

RN 90-38 Handling Decision Problems: A Structuring Language and Interactive Modules, Humphreys, P.C.; Wisudha, A.D.; Wooler, S.; Oldfield, A. July 1990. (AD A226 196) This report describes the result of the second year's work on a 3-year project designed to identify and develop methods of effective support for higher-level decision making where the use of decision makers' own language in identifying and structuring problems is important. It examines the four classes of systems and tools for decision support that need to be provided within the general procedural schema for han-

dling ill-structured decision problems to provide a comprehensive library of microcomputer-based tools for handling such problems at strategic and lower levels. Analysis of results confirms the basic hypothesis—problem handling is management strata specific. Higher strata managers employed better structuring processes in their problem handling; they proposed less strategic issues and more tactical issues both at the beginning and at the end of the decision conference. We also focused on identifying differences in perspectives of stakeholders in a risky technology, that of hazardous waste incineration in a real-life setting. We studied groups of stakeholders in industry and government (regulatory agency) as well as lay people and a pressure group.

RN 90-39 Problem Solving and Learning in a Natural Task Domain,

Kolodner, J.; Barsalou, L. July 1990.

(AD A222 293) Based on work done in Year 1 of the contract analyzing protocols of students solving diagnostic problems, work in Year 2 of the contract has taken two directions: the creation of AI simulation models to explain several of the learning processes used by students and the creation of an experimental tool and formulation of experiments to find out more about how people learn during problem solving and instruction. This report is divided into two sections. In the first section, the experimental tool and experiments are discussed. In section two, beginning on page 27, some of the AI simulation models are presented.

RN 90-40 Semi-Automatic Methods of Knowledge Enhancement,

Michie, D.; Hayes-Michie, J. July 1990.

(AD A222 292) The objectives of the project are concerned with the representation of human concepts in machines. The issues addressed are: 1. how to automate the development of concepts from examples supplied by an expert. 2. how to automate the validation of fac-

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tual databases which have been generated by a machine. 3. how to automate the development of concepts summarizing the information in comprehensive databases of raw facts. 4. how to achieve (3) above for problem domains so complex that no effective human concepts exist, or can be constructed by expert brains ("Ultra-Complex Domains" or UCD's). 5. how to develop machine methods for imparting these concepts to human experts, thus providing a method for mastering what was previously impenetrable. For reasons of economy and ease of control, the chosen problem domains were chess endgames. Substantial results have been achieved with automatic structuring of problems and the design of primitive "starting" concepts, previously the province of the human intellect. The investigators believe that this work has forced an entrance to territory new to computer science in which the mental labor of specifying and programming is largely shifted from the human to the computer. In particular problems previously too complex to program have been rendered accessible, and a methodology established for generalizing this result.

RN 90-41 Diagnostic Inference: People's Use of Information in Incomplete Bayesian Word Problems, Hamm, R.M. July 1990. (AD A227 678) Probabilistic inference word problems require people to integrate three types of information concerning a hypothesized cause of an event—base rate information $p(H)$ concerning the relative frequency of the cause in question, evidence E that the cause was responsible, and the reliability of that evidence $p(E/H)$ —and to evaluate the probability $p(H/E)$ that the cause in question was responsible for the event. Three classes of hypothesis are proposed to explain how people answer these word problems and why the answers often neglect the base rate information—normative probabilistic reasoning, heuristic strategies, and nonnormative information integration. In a questionnaire study, 265 students estimated the probability

of the cause before and after each type of information was presented. Information was presented in 6 orders, so some subjects responded to each possible subset of the information. Findings include the following: (1) Many subjects respond with numbers that are available in the problem presentation, (2) the more recent information has a greater impact, (3) there is no universally applied weighted averaging scheme that accounts for the average response in all conditions, and (4) the typical subject's responses are well described in terms of the use of strategies contingent on the kind of information that is available. A production system simulation of the typical responses and the normative responses shows that the neglect of the base rate information occurs in part because of a misunderstanding of the reliability information, specifically, a confusion between $p(H/E)$ and $p(E/H)$. Recommendations for improving probabilistic inference are evaluated in light of these results.

RN 90-42 Distributed Decision Making in Wildland Firefighting,

Taynor, J.; Klein, G.A.; Thordsen, M.L. July 1990. (AD A225 413) This study examined distributed decision making in a naturalistic context. The subjects—expert, command level, wildland firefighters—were studied as they made decisions about an ongoing set of wildland fires. Interviews were conducted using the critical decision method, which is a semi-structured technique for probing nonroutine incidents. Seventeen decision makers were studied, and a total of 110 decision points were probed. For most of the decision points, recognition strategies were used. This was more pronounced for functional decision points. Analytic strategies were used in the majority of organizational decision points. Researchers found that the decision makers were heavily dependent on outside sources for critical information; sources within the organizational structure as well as sources from other organizations were frequently used. Comparisons

were made to military command-and-control organizations, and some conclusions were drawn regarding factors promoting effective distributed decision making.

RN 90-43 Selection and Effects of Channels in Distributed Communication and Decision-Making Tasks, Reder, S.; Schwab, R.G. July 1990. (AD A225 414) This report describes the second year of a project that is researching the communication patterns of selected workgroups. Emphasis is on the definition and analysis of selection of channels (e.g., face-to-face meetings, phone, electronic mail, etc.) and the effects of those choices on the ensuing communication and task-oriented activities. Preliminary findings suggest implications for both the design of organization and communication support systems.

RN 90-44 Protocol Analysis of Expert/Novice Command Decision Making During Simulated Fire Ground Incidents, Calderwood, R.; Crandall, B.W.; Baynes, T.H. July 1990. (AD A225 666) This research is part of a series that investigate how decisions are made in operational settings by trained personnel. The focus is on environments in which strategic and tactical decisions must be made under conditions of uncertainty, risk, and time pressure, such as urban firefighting. Verbal protocols were obtained from professional urban firefighters during simulated incidents in which they were asked to assume the role of fire ground commander. This approach afforded an opportunity to examine decision making in an ecologically valid way and to obtain a rich source of data for addressing issues of inference, expectancies, and tacit knowledge that are part of decision making in real-world settings.

RN 90-45 BATBook: An Online Book and Problem Solving Environment

for the Study of Skill Acquisition, Faries, J.; Reiser, B.J. July 1990. (AD A225 699) BATBook is an online book and problem-solving environment that facilitates students' use of examples in a text book and use of their own solutions to previous problems. BATBook contains facilities for working on problems and storing solutions and for reading and searching text and examples within the text. All interaction with the system is recorded. BATBook serves as an experimental tool for studies of the use of examples in learning. BATBook has been used for studies of skill acquisition in the programming domain and can be used in similar fashion for other domains such as statistics, mathematics, or physics.

RN 90-46 The Learning Strategies Program: Concluding Remarks, Lintern, G. July 1990. (AD A226 016) The work of the Learning Strategies program reported in this paper marks a substantial advance in our knowledge about principles of training. Aspects of part training, adaptive training, task load effects, specialized skills training, and generalized skills training are addressed. Some research in prediction of performance for complex tasks and analysis of tasks for training purposes is also presented. The Learning Strategies program has used an appropriately complex task to address basic questions. This effort has led to the development of principles at a level of abstraction that should permit effective exploitation of those principles in a wide range of operational environments.

RN 90-47 Theories, Models, and Tools for the Design of User-Centered Computer Systems, Fischer, G.; Kintsch, W. July 1990. (AD A225 700) There are many aspects to the term "user-centered." For this research, we have concentrated on the issue of information management. Our theoretical starting point was to identify the distinction between two levels of mental

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representations that users have of the tasks they want to perform on personal computer systems. In our proposal to ARI, we planned to distinguish between a situation model and a system model. The situation is a representation of the task the user wants to perform in terms of the specific task domain. It is subjective and varies somewhat among individuals, but our assumption has been that it is well specified. In order to do anything, however, the user's situation model must be transformed into a system model, which is normative and system specific. This distinction has been the driving idea behind the theorizing and system building in this project. Our question has been, how, for a variety of tasks in which information management plays a central role, this transformation is achieved, and what system support can be provided for it.

RN 90-48 An Integrated Cognitive Architecture for Autonomous Agents

Agents, Langley, P.; Thompson, K.; Iba, W.; Gennari, J.; Allen, J. July 1990. (AD A225 701) This report describes ICARUS, a cognitive architecture designed to control the behavior of an integrated intelligent agent. The framework assumes that all long-term knowledge is organized in a probabilistic concept hierarchy, that heuristic classification is the central performance mechanism, and that a process of concept formation underlies all learning. The three components of ICARUS are described and related to other cognitive architectures.

RN 90-49 Techniques and Tools Providing Strategic Decision Support: A Framework, Review, and Guidelines

Humphreys, P.C.; Wisudha, A.D. July 1990. (AD A226 306) This research surveys and describes the potential applications of 58 tools for structuring and analyzing decision problems. It examines the mode of operation and support capabilities of the more promising tools in detail and concludes with an over-

all evaluation and guidelines for future tool development. This research is an extension to and update of: (1) Method and Tools for Structuring and Analyzing Decision Problems (Technical Report 87-1), and (2) Building a Decision Structuring Library (Technical Report 88-1).

RN 90-50 The Contribution of Group Members' Cognitive Resources to the Effectiveness of Small Groups

Fiedler, F.E. July 1990. (AD A226 005) This project identifies the condition under which certain cognitive resources, specifically, the work-related experience and intellectual abilities of leaders, contribute to effective performance. This report describes the main activities and principal findings of this effort. Experience contributes to performance under stress. More intelligent leaders search for more information and view information items more often than do less intelligent leaders. More experienced leaders search for less information than inexperienced leaders and make more accurate decisions only under stress. Stress did not affect such leadership functions as communications and administrative duties.

RN 90-51 Decision Making in Armored Platoon Command

Brezovic, C.P.; Klein, C.P.; Thordsen, M. July 1990. (AD A231 775) This Research Note studies command decisions during armored platoon leader training exercises. The Critical Decision method was employed to identify command decisions and the environmental features of decision situations offering a command challenge to the students. The student platoon leader, the trainer evaluating his performance, and one researcher all rode the platoon leader's tank and observed the events from the same perspective. A total of 57 decision points were identified and probed. The interviews collected direct contrasts between the more experienced trainer and the new student for the analysis of decision situations and

factors affecting decision making. The students deliberated during option selection in approximately half of the decisions. They also reported relying on analogues to select their choice of options in close to half of the decisions, but the use of analogues ranged from helpful to disruptive in resolving decision situations. Option deliberation and analogue use as strategies in decision making by the novices were more frequent than in previous work with more experienced decision makers. Poor performance by the students was consistent with their inability to imagine hypothetical situations, such as enemy actions, and the relationship between friendly and enemy tactics. The findings suggest that performance errors were due not to a limited ability to monitor situational cues, but to the misinterpretation of the cues. The results were contrasted to traditional decision-making literature. Training methods were recommended that would incorporate the implications of the study findings.

RN 90-52 A Cognitive Basis for a Computer Writing Environment,

Smith, J.B.; Lansman, M. July 1990.

(AD A225 734) The research of cognitive psychologists and composition theorists offers important insights that can guide development of more compatible computer systems. In the sections that follow we first review some of their more important theories and experimental results in order to establish a cognitive basis for a computer writing environment. We then show how those insights influenced key design decisions for a system we are developing. While our system could be used by a variety of writers for many different purposes, it is intended primarily for professionals who write as a part of their jobs. Nevertheless, we believe it illustrates the important relation between cognitive theory and system design and the necessity to consider them together. Our discussion ends with a brief description of our efforts to test both the theoretical basis and

the system we have developed in accord with it.

RN 90-53 Intelligent Support Systems for Hyperknowledge, Fischer,

G. July 1990. (AD A229 109) Computer systems can assist in searching, understanding, and creating knowledge in creative problem solving. We have explored this idea in the context of building a variety of intelligent support systems for high-functionality computer systems, emphasizing the following specific issues: representation of programs as knowledge networks where the code, the documentation, and visual representations are external representations generated from the same complex internal knowledge structure; user-definable filters to give users control of the parts they would like to see; constraint mechanisms to maintain consistency between internal and external representations; different browsing systems to explore hyperknowledge spaces and design kits as prototypes of hyperknowledge assistants. To increase the usefulness of high-functionality computer systems, they should be constructed as hyperknowledge systems where the intelligent support systems are an integral part of the overall design.

RN 90-54 The Effects of Instructional Method and Individual Differences on the Cognitive Processing of Instruction, Tobias, S. July 1990. (AD A226 004)

This research examined achievement-treatment interaction (ATI) between individual differences and instructional methods on the cognitive processing (i.e., macroprocessing) of instruction. Individual differences in reading, prior knowledge, and anxiety were examined for three treatments (an adjunct post question with feedback group, a reading only adjunct postquestion group, and a reading only control group). The macroprocesses studied included previewing, reviewing, notetaking, and use of an alternate text. Multivariate regression analysis of the posttest scores re-

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vealed main effect for treatment, prior knowledge, and anxiety. Regression analysis of the macroprocesses revealed main effect for treatment, a main effect for anxiety on use of alternate text, and anxiety and prior knowledge interaction for both use of alternate text and use of headings, and an anxiety, prior knowledge, and treatment interaction for use of alternate text. These results are discussed in the framework of prescriptive learning strategies.

RN 90-55 A Short Review of Human Motor Behavior: Phenomena, Theories, and Systems, Iba, W. July 1990. (AD A226 271) In this paper we survey three facets of human motor behavior—phenomena, theories, and implementations. We are particularly concerned with motor behavior that exhibits improvements over time and practice; this is referred to as *human motor learning*. We begin by discussing both performance and learning phenomena that have been observed in laboratory situations. This is followed with a review of three prominent theories of human motor control from the psychological literature. The performance and learning phenomena serve as a foundation on which to compare these theories. Finally, we consider several implemented models of motor learning that have attended to constraints imposed either by the phenomena introduced earlier or by the psychological structure of the human neuromuscular system. From the material surveyed, we conclude that more research on computational models would help answer questions in human motor behavior.

RN 90-56 Strategy-Based Technical Instruction: Concept Mapping and Textual Disruption, Dansereau, D.F. July 1990. (AD A231 771) This research note summarizes tasks completed during the reporting period. The interlocking experiments covered by the section on concept mapping examine concept maps as a substitute for text. The efficacy of scripted cooperative learn-

ing as an approach to map processing is also explored. The second section explores the effect of textual disruption on individual and dyadic learning.

RN 90-57 Meanings of Nonnumerical Probability Phrases: Final Report, Wallsten, T.S. July 1990. (AD A226 544) This report summarizes three years of research on the meanings of nonnumerical probability phrases. The work is relevant to military needs because often the uncertainty of decisions is not well represented by the probability theory, but rather is imprecise, vague, or based on linguistic input. Techniques were developed for representing the vague meanings of linguistic probabilities to individuals in specific contexts as membership functions over the (0, 1) interval. There are large, consistent individual differences in the meanings of probability phrases within a single context. Additional research investigated context factors that affect the meanings of such phrases, such as the available vocabulary, direction of communication, desirability of the forecasted events, and the base rates of the forecasted events. The researchers also summarized experiments that compare decision making in response to numerical and linguistic probabilities. Finally, a theory that handles virtually all the empirical results was outlined. This theory suggests how the vague meanings of probability phrases are altered by context and integrated into single values to make judgments and choices.

RN 90-58 JANUS: Integrating Hypertext With a Knowledge-Based Design Environment, Fischer, G.; McCall, R.; Morsch, A. July 1990 (AD A231 773) Hypertext systems and other complex information stores offer little or no guidance for users who need to find useful information. Most users are not interested in exploring a hypertext information space, but in obtaining information to solve problems or accomplish tasks. As

a step toward helping users find information, we have developed the JANUS design environment. JANUS allows designers to construct artifacts in the domain of architectural design and, at the same time, to be informed about the principles of design and the reasoning underlying them. This process integrates two design activities: construction and argumentation. Construction is supported by a knowledge-based graphic design environment and argumentation is supported by a hypertext system. Our empirical evaluations of JANUS and its predecessors show that integrated support for construction and argumentation is necessary for full support of design.

RN 90-59 Investigations of Naturalistic Decision Making and the Recognition-Primed Decision Model, Klein, G.A.; Calderwood, R. July 1990. (AD A226 006) This monograph reviews 3 years of research that explores how experienced personnel make decisions in operational settings characterized by real-time information processing, shifting goals, and high-risk consequences. The study combined field studies with experiments designed to test specific hypotheses. Study domains were selected so that findings would have high potential for generalizing to military command-and-control decision-making. Researchers carried out critical decision interviews with experienced personnel, including urban fire ground commanders, wildland fire incident commanders, and U.S. Army tank platoon leaders. Interviews were designed to elicit information about the cues, goals, and option evaluation strategies used by these personnel. Based on these interviews, the relationships among such factors as time pressure, experience level, and group interactions were explored. The results of these studies have been used to develop a Recognition-Primed Decision (RPD) model of decision making. This model contrasts with current normative and prescriptive models of decision

making, and the implications of this alternative framework are explored.

RN 90-60 A Model of Employment Decision Making: An Analysis of Quit/Stay Decisions of Junior Officers, Lal, R.; Lakhani, H.A. July 1990. (AD A226 881) The objective of this report is to identify and analyze the effect of variables that guide the decisions of junior officers to stay or quit the Army. Data from DOD Survey of Families, 1985, are used in a simultaneous equations model of retention and satisfaction with military life. The results reveal that retention intention is positively related to satisfaction with military life, promotion opportunities, age, and years of service; and is negatively related with officers in technical occupations, those likely to join Reserve/National Guard units, and male officers. Estimation of separate models for officers by source of commissioning indicates that West Point graduate officers are more responsive to military pay relative to other sources of commissioning. It is also cost effective for the Army to retain the former by increasing their pay.

RN 90-61 The Employment Status of Army Spouses, Schwartz, J.B.; Griffith, J.D.; Wood, L. July 1990. (AD A226 880) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family* and *The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report investigates the employment status of Army spouses, especially wives, who are in the civilian labor force or seeking to enter the labor force. It (1) describes labor force participation, employment, and earnings of military spouses relative to demographically

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similar civilians; (2) describes labor force participation, employment, and underemployment (i.e., not using training, experience, and skills on the job) of Army spouses; and (3) describes factors that lead to Army spouse satisfaction with military life.

RN 90-62 Distributed Problem Solving: Adaptive Networks With a Computer Intermediary Resource, Lyman, J.; White, S.; Young, P. July 1990.

(AD A226 346) Distributed problem solving networks are omnipresent decision-making structures with often untapped potential. The power of these networks cannot fully be recognized until the basic processes within the network are understood. A major source of disruptions in the network is the degradation of processes caused by uncertainty. Many uncertainty sources have technological solutions, such as increased sensor capability, increased communication bandwidth, or increased processing power. Inter-agent uncertainty is a more fundamental group dynamics problem without an obvious technological solution. Establishing and understanding inter-agent uncertainty reduction processes is necessary for a more effective utilization of the distributed problem-solving network. Forcing disagreeing agents to resolve their differences under control of a predefined set of rules is a proposed method of attacking this problem. The first report proposes a testbed design to study the process using input/output analysis. The difference resolving rules are inputs; the measures of group performance, the outputs. The second focus is the assessment programs/instructions.

RN 90-63 Interpretation of Conditional Probabilities in Probabilistic Inference Word Problems, Hamm, R.M.; Miller, M.A. July 1990. (AD A226 907)

People's strategies on probabilistic inference word problems were investigated in an attempt to determine which of three theories explains their neglect of base rate information when es-

timating the probability of a hypothesis. These word problems present a base rate or prior probability ($p(h)$), some evidence (e) that typically conflicts with the prior expectation, and information on the reliability of the evidence, which is stated as $p(e/h)$, the conditional probability of the evidence being seen if the hypothesis is true. The three theories are (a) subjects believe that the base rate is irrelevant; (b) they integrate base rate and evidence in a manner that underweights the base rate; or (c) they misinterpret the reliability information $p(e/h)$ as if it were $p(h/e)$. Data using four distinct methods support the theory that subjects confuse the conditional probabilities.

RN 90-64 The Army Family Research Program: Sampling Plan for the CORE Research Program, Iannacchione, V.G. July 1990. (AD A227 586)

The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report provides details of the sampling design for the soldier portion of a worldwide sample of soldiers, leaders, service providers, and spouses that was conducted between February 1989 and May 1990. Specific topics addressed include (1) a description of the population being sampled, (2) the sampling frames used during each of the three sampling stages, (3) the allocation of types of individuals to be sampled, and (4) the rules for selecting potential participants for the survey.

RN 90-65 The Army Family Research Program and the Selection and Classification Project Data Base, Sadacca, R. July 1990. (AD A227 585)

The Army Fam-

ily Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. The purpose of this was to present the scope of the selection and classification project (Project A) and to describe the kinds of analyses that might be undertaken by AFRP scientists using joint AFRP/Project A samples.

RN 90-66 Leadership for the Nineties: Development of Training and Research Instruments, Boice, L.R.; Tarr, H.C. July 1990. (AD A227 949) This research has demonstrated that small-unit cohesion bears a strong positive relationship to small-unit combat performance and resistance to combat stress. Similarly, personnel turbulence, which negatively affects small-unit integrity and leader-led stability, has been shown to erode cohesion, resulting in a reduction of soldier performance. This report integrates historical and recent research literature to document the relationship among cohesion, performance, and personnel turbulence and to investigate the effect of leadership training and division-level policies concerning soldier assimilation and integration on cohesion in a newly activated COHORT battalion. Survey instruments administered to members of both COHORT and non-COHORT battalions confirmed the three-dimensional factor structure of cohesion cited by previous researchers: horizontal, vertical, and organizational bonding. Analyses of the data at both individual and squad levels indicate that cohesion is significantly and consistently correlated with psychological readiness (for combat), a construct also measured by the survey.

RN 90-67 Labor Force Participation, Employment, and Earnings of Married Women: A Comparison of Military and Civilian Wives, Schwartz, J.B. July 1990. (AD A226 270) The purpose of this research was to examine labor force participation, employment, and earnings of military and civilian wives to determine if there are significant differences in work outcomes for these women, and to examine the underlying factors that may be responsible for these differences. The March 1985 Current Population Survey data were used in the analyses. Military wives were found to be less likely to participate in the labor force than comparable civilian wives. The findings suggest that military wives do not earn significantly different wage rates or annual incomes compared to civilian wives after controlling for other individual and household differences. However, frequent relocations and being located away from large population centers do appear to negatively affect the earnings of military wives when compared to civilians.

RN 90-68 Family Economics and the Retention Intentions of Army Enlisted Personnel, Wood, L. July 1990. (AD A226 448) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. The purpose of this research was to examine the links between economic factors, the nonpecuniary elements of military life, spouse satisfaction with the military, and the member's retention intentions. The data consisted of 4,073 observations from the Army sample who responded to the 1985 Department of Defense (DOD) Survey of Enlisted Per-

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sonnel and Military Spouses. The results indicate that family economic factors including spouse employment, member wages, and receipt of food stamps are important in the determination of member retention intentions. Accompaniment status is another determinant. The wives' satisfaction with the military does not significantly influence members' retention when variables that affect spouse satisfaction and member retention intentions are controlled. Labor force outcomes and several Army policy variables are important in determining Army wives' level of satisfaction with military life.

RN 90-69 Identification of Strong/Well Families and the Mechanisms to Support Them, Bowen, G.L. July 1990. (AD A225 740) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report provides an overview and brief summary of the research on family strength that was the basis for a conceptual model of family strength and adaptation in the Army. The report presents a theoretical model and discusses key concepts in the areas of family stressors, family adaptive resources, and family adaptation.

RN 90-70 Acquisition and Processing of Information During States of REM Sleep and Slow-Wave Sleep, Mollon, J. July 1990. (AD A231 772) This research note reviews, analyzes, and summarizes experimental literature on "Sleep learning." The findings are as follows:

- Serious methodological flaws were found in all reported positive results. There is no evi-

dence that semantic learning occurs when verbal material is presented to sleeping subjects.

- A critical but open-minded test of sleep learning has not been done. Recommendations are made for an appropriate experiment.
- If new material is presented to the sleeping subject, there is danger that it may interfere with normal nighttime processing of earlier daytime experiences.
- It is possible that external stimuli could be used to prompt and direct information processing during sleep to favor one set of material in preference to others. This could apply to skill learning as well as declarative memory, with considerable potential relevance to soldier training.

RN 90-71 Training for Retrieval of Knowledge Under Stress Through Algorithmic Decomposition: Third Year Annual Report, Zakay, D.; Kessel, C. July 1990. (AD A226 875) This research reports on six studies that deal with retrieval of knowledge under private and general uncertainty and with solving base-rate problems. Methods of information integration and verbal protocols analysis were utilized in the first two studies. Feelings of confidence, the influence of occupation characteristics on estimation processes, the effect of teamwork in knowledge retrieval, and the effectiveness of increasing awareness of naive estimation processes were all explored.

RN 90-72 The Development and Implementation of Career Information and Guidance Systems to Enhance Recruitment and Retention of ROTC Cadets for Army Careers, Banikiotes, P.G.; Webster, K.K. July 1990. (AD A226 319) The Career Information Survey (CIS) was developed with two existing instruments, the Career Development Inventory (CDI) and the Values Scales (VS), and administered to a

group of 64 college-bound high school males. Students with positive, neutral, and negative attitudes about the Army ROTC program were compared on the CDI and VS scales and on four variables measured by the CIS: knowledge and importance of knowledge about the Army ROTC program; desirability of occupations within military and nonmilitary settings; and preferences for alternative military career paths. The results indicate that knowledge about Army ROTC and, most specifically, knowledge about career prospects is strongly related to having a positive attitude about Army ROTC program. In addition, accurate information can best be received from military personnel and good advice can best be received from educational personnel. Although the military setting overall is less appealing than the government and private sectors, it is appealing for those with positive attitudes about the Army ROTC program who plan careers in the sciences. Various active and reserve duty career paths appeal to different types of individuals. Individuals with a positive attitude about the Army program have more career plans than those with neutral and negative attitudes. Suggestions for future efforts include refining the CIS; collecting data from other regions, college students (both in and out of the Army ROTC), and females, both in high school and college; gathering additional information to further explore individual differences; pilot testing recruitment efforts using both pencil and paper testing and physiological measurement technology to examine experimentally manipulated variables such as type and source of information and modality of presentation; and developing model career information and counseling programs at several to implement at several campus ROTC units.

RN 90-73 Investigations of Probabilistic Inference, Hamm, R.M. July 1990. (AD A226 882) Reports first-year results of project, "The Use of Protocol Analysis

and Process Tracing Techniques to Investigate Inference." Research indicates that the most recently presented information is given more attention in situations that require the integration of information about expectancies with uncertain information about what is happening at present. In addition, subjects have difficulty distinguishing two types of conditional probability information, the reliability $p(\text{evidence}/\text{hypothesis})$ and the probability that the hypothesis is true if the evidence is observed, $p(\text{hypothesis}/\text{evidence})$.

RN 90-74 Development of Stratified Systems Theory for Possible Implementation in the U.S. Army, Jaques, E.; Stamp, G. July 1990. (AD A226 910) This report outlines the main features of a 3-year research project to contribute to concepts and principles for leadership and organization in defense forces, with respect both to preparedness in peacetime and to action in combat. The thrust of the project was to examine the possible consequences for defense force organization and leadership of a new and different conceptual approach, Stratified Systems Theory (SST), to such issues as levels of command organization, creative leadership development, manning, officer efficiency, and information, communication, and control processes, as related to the operational defense force tasks and unit performance. The program content and output include (1) organizational structuring of the Army, (2) analysis of the work and development of leadership at senior executive levels, (3) validation and development of the Career Path Appreciation (CPA) procedure for assessment of individual capability and potential, and (4) consequences of SST for various aspects of the Army's personnel management system.

RN 90-75 Discriminative Environmental Properties in Terrorist Environments: A Basis for Training, Taylor, M. July 1990. (AD A226 451) The purpose of

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this project was to identify and describe environmental and contextual cues that are available to experienced security force personnel and that may be associated with terrorist threat, to establish the discriminative stimulus properties of these cues and the characteristics of their relationships to relevant behavior, and to develop a rationale for designing training techniques. All evidence from the work suggests that cues that might give warning are present in all of the incidents investigated, although their recognition may require vigilance or recognition of the significance of a "normal" event in the context of the activities in question.

RN 90-76 An Evaluative Study of the Defense Mechanism Test, Stoll, F.

July 1990. (AD A226 946) This report is a review and evaluation of concept, application, and literature on the Defense Mechanism Test. The instrument, developed in Sweden in the 1950's, purports to pinpoint accident-prone pilots before they enter the cockpit of an airplane. The information reviewed includes reliability of the test, reliability of test administration, coding and evaluation, test-retest reliability, validities, and comparative credibility of data from use of the instrument in the selection of pilots.

RN 90-77 Decreasing Damaging Effects of Stress-Bound Situations: Toward a New Model of Leadership Under Stress: Final Report, Pereira, O.G.; Jesuino, J.C.

July 1990. (AD A226 909) In the battlefield of the future, the number of stress reaction casualties is expected to outnumber all other types of casualties. In addition, in jobs or tasks where stress is unavoidable, repeated exposure is likely to produce relatively permanent damage in groups or individuals. Research by Pereira (from 1964 to 1981) demonstrated such outcomes for marines involved in counterguerrilla activity and Pereira and Jesuino (1982) found that appropriate leader-

ship may buffer unwanted stress consequences. To better understand this finding, the authors studied 239 marines in the present-day setting. The results of direct observations, interviews, and questionnaires show that leadership behavior, namely the discretionary component, has a significant bearing on the stressors-strain interface. A longitudinal study on 28 Naval Reserve cadets during a 9-month course revealed that stress levels decrease with time and adaptation. For different populations like firemen and professionals of the service sector the importance of high organizational stress strongly contrasts with the Marines' data, hinting that a model of leadership under stress should be contingent upon the particular organizational pattern and culture. To test a possible model, a quasi-experimental study trained 18 instructors and observed 299 trainees in two conditions and in two courses. It was found that, when the instructors gave high or low support to their trainees, the trainees' stress levels, satisfaction, and performance varied accordingly, and that 1 year after, the instructors' behavior had an enduring influence in the adaptation of marines to their regular duties. On the basis of the study results, two models may be postulated: (1) Formal leaders and, moreover, authoritarian ones, in situations of high organizational stress, become confounded with the organization and are unable to manage the trade-off between the follower's performance and satisfaction. They become a source of stress contributing to the new increases of organizational stress. (2) On the contrary, discretionary leaders, as they have to stand in between the organization and the followers, are able to increase or decrease their strain by withholding or providing support, respectively, and, as a consequence, to manage the trade-off performance and satisfaction. The present series of studies stresses the need to consider stress as crucial intermediary variables in studies of leadership and organizational behavior.

RN 90-78 Basic Research in Human Factors, Van Cott, H.; Neilsen, E.

July 1990. (AD A226 318) This report outlines the purpose, membership, and recent activities of the Committee on Human Factors. It summarizes current studies in the areas of human performance models, multicolored displays, distributed decision making, expert systems, and aging. The report also discusses reports from 1984 through 1988 that represent the areas listed above.

RN 90-79 Optimizing the Long-Term Retention of Skills: Structural and Analytic Approaches to Skill Maintenance, Healy, A.F.; Bourne, L.E., Jr.; Ericsson, K.A.; Anders, K. July 1990.

(AD A229 519) This research program seeks to identify the characteristics of knowledge and skill most resistant to decay due to disuse. The program is divided into analytic and structural approaches. We performed two types of research to investigate skill retention and maintenance using the analytic approach. The first investigated different laboratory analogues of component military skills; the second investigated parallel natural skills learned by the college population during their prior education. We have developed five laboratory methodologies and completed experimental studies using each of them. We have also identified four natural skills and gathered long-term retention data for each of these skills. For the structural approach, we designed an experimental paradigm that allows us to assess the detailed encoding of new knowledge at presentation and at delay using verbal report techniques and chronometric measurement of retrieval components. Several studies of retention of vocabulary items have been completed within this paradigm.

RN 90-80 Pertinent Factors Which Affect the Representation of Women and Minorities in Scientific, Engineering, and Technical Careers, Kay, N.W.

July 1990. (AD A231 827) This research note is an interim report on the progress of the research project "A Study to Determine and Test Factors Impacting Upon the Supply of Minority and Women Scientists, Engineers, and Technologists (SETS) for Defense Industries and Installations." The purpose of the research note is to identify previous work in this area, particularly empirical research. Another focus is identification of interventions that investigators have reported to be successful.

RN 90-81 Developing Training and Evaluation Scenarios for Armor Using Simulation Networking-Developmental (SIMNET-D), DuBois, R.S.; Birt, J.A. July 1990. (AD A226 407) This report documents a series of procedures and guidelines for developing training and evaluation scenarios or exercises using the Army's interactive simulation testbed, Simulation Networking-Developmental (SIMNET-D). These procedures result from and are illustrated by the experiences gained through the conduct and support of concept evaluations of the M1 Abrams Block II subsystem using SIMNET-D.

RN 90-82 Mental Models and User-Centered Design, Turner, A. (ed.).

July 1990. (AD A227 587) This report is a compendium of papers by people who attended the 1988 workshop on mental models and user-centered design at Breckenridge, Colorado. Subjects covered in these papers include action planning, an evaluation of retrieval of information, types of knowledge in knowledge acquisition and their roles, design evaluation, organizational influences on design, and mental models from various perspectives.

RN 90-83 Adaptive Human-Computer Interfaces Using Expert Profiles,

Williges, R.C.; Elkerton, J.; Vicente, K.J.; Hayes, B.C. July 1990. (AD A226 906) Adaptive human-computer systems accommodate a wide variety of users learning to interact

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with computers because they adjust to different skill levels and provide novices with appropriate levels of expertise needed to perform certain tasks. This effort was directed toward developing improved models of experts based on goal-based models and toward assaying and isolating individual differences of inexperienced users in order to adapt the software interface to these individual differences. Results show that inexperienced computer users were more variable in their search times than experienced users and that slower users selected more inefficient search commands. Two performance-based and one cognitive-based command selection aid improved search performance and strategies of slower, inexperienced users. Since spatial and verbal ability were found to correlate positively with search strategies, inexperienced users learned to select fewer and more efficient commands when provided with spatial augmentation (graphic presentation).

RN 90-84 Stress, Babble, and the Utilization of Leader Intellectual Abilities, Gibson, F.W.; Fiedler, F.E.; Daniels, K.M. July 1990. (AD A226 947) Research has demonstrated that, under stress, leader abilities are often unrelated to or are detrimental to group performance. This study seeks to identify group process variables that account for such counter-intuitive findings. Researchers conducted a content analysis on written transcripts of group problem-solving sessions. Moderated multiple regression analyses indicated that, under stress, more intelligent or creative leaders suppressed the contribution of members by limiting member talking and idea generation. Idea suppression in particular led to "babbling" (suggesting few ideas per unit of talk) on the part of members with more creative leaders. Stepwise multiple regression analyses subsequently revealed that member babbling significantly predicted group performance; groups whose members babbled less performed best.

RN 90-85 The Sociology of the Army Non-commissioned Officer: A Preliminary Assessment, Moskos, C. July 1990. (AD A226 716) The working assumption of this paper is that noncommissioned officers (NCOs), theoretically as well as substantively, are worthy of study separate from professional soldiers and enlisted men. This report contains mainly tabular data. An examination of the available statistical data highlights significant social and demographic trends in the NCO corps. Major findings include changes in the percentages of enlisted members, black NCOs, and female NCOs, time to promotion to NCO status, and data concerning marriage and children.

RN 90-86 The Sociology of Army Reserves: An Organizational Assessment, Moskos, C. July 1990. (AD A226 888) This report outlines the ways in which conventional military sociology is inappropriate for an understanding of reserve components. Issues include potential for using "professional reservists" on a part-time basis, alleviating unit pressures on reservists with demanding civilian careers, reconstituting military schools to accommodate time demands of reservists, feasibility of "buying-out" superannuated personnel to foster early retirements, and the utility of wargaming computers to aid training in interechelon and interunit coordination.

RN 90-87 The Sociology of Army Reserves: A Comparative Assessment, Moskos, C. July 1990. (AD A226 717) This report highlights the core characteristics of the American Reserve System with a comparative analysis of reserve forces in the Federal Republic of Germany, the United Kingdom, and Israel. The analysis adopts a case-based approach and uses qualitative binary methodology. The following are the core elements of the social organization of American reserve components: (1) No other reserve

system requires as much training time for its members; (2) no other reserve system relies on reservists for basic full-time support; (3) no other reserve system has a well developed career path (with a corresponding professional military education system) leading to senior command and staff positions; and (4) in no other reserve system do reservists have such limited real vacation time.

RN 90-88 The Sociology of Army Reserves: Final Report, Moskos, C. July 1990. (AD A226 718) This report presents a conceptual framework of reserve components. The focus is on the Selected Reserves of the U.S. Army. The guiding principle of the report is that reserve components are more than just an organizational variation of active components. The core characteristics of the reserve components are highlighted by an organizational contrast with active-duty components and by a comparative contrast of American reserves with those of other Western countries. The following variables differentiate reserves from active-duty components: (1) Normative motivation is a significant factor; (2) MOS mismatch is a problem; (3) Family conflict is greater with seniors than juniors; and (4) Career development increasingly comes into conflict with the pressures of demanding civilian occupations. Comparative analysis identified the following as the unique elements of the American reserve system: (1) more training time; (2) reliance on reservists for full-time support; (3) career path (with a corresponding professional military education system) leading to senior positions; and (4) limited real vacation time. The sum effect of these conditions is that American reserves face exceptional conflict between reserve duties and civilian employment responsibilities. Such conflict promises to become more severe as reserve components become increasingly integrated with the active force under Total Force concepts. This report makes policy recommendations.

RN 90-89 Second Year Report: Psychological of Courageous Performance in Military Personnel, Rachman, S. August 1990 (AD A231 774) This research reports on the second year of the project to identify psychological markers of courageous military performance. Findings indicate that means and standard deviations of heartrate responses of 28 bomb disposal operators during a lab stress test are similar to patterns recorded for previous groups of operators. Individual profiles were constructed for each operator. Physiological and psychometric data for the operators are internally consistent, but weakly correlated with each other. Preliminary analyses indicate that, as expected, low anxiety and heartrate activity is associated with superior performance in the field. Moreover, decorated operators responded stably and without anxiety during pre-tour stress tests. Early results on optimism and courage form no clear pattern.

RN 90-90 Pedagogical Strategies for Human and Computer Tutoring, Reiser, B.J. August 1990. (AD A226 886) This report considers the pedagogical strategies of human tutors and examines the implications of this work for research in intelligent tutoring systems. It briefly describes GIL, an intelligent tutor for simple LISP programming, and considers its effectiveness from the perspective of human tutoring strategies. Finally, it discusses the implications of research on human tutoring for the design of intelligent tutoring systems for problem solving.

RN 90-91 Recognition-Primed Decision Strategies: First-Year Interim Report, Klein, G.A.; Crandall, B.W. August 1990. (AD A226 887) For this research, the goal of the first year was to expand our understanding of recognitional decision making specifically in terms of how situation assessments are communicated. Three studies were proposed. We have completed two of them and

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have initiated the third. In addition, we have started a project originally planned for year two. The projects completed were a literature review in the area of situation assessment and a multidimensional scaling experiment of expert and novice firefighters. This experiment was one of the first to use situations as stimuli, rather than simple cues such as words. The results suggest that experienced fire-ground commanders do not have static schemata for firefighting situations; there was low consistency between ratings made during different sessions. In addition, the importance ratings for concepts were influenced by the goal context.

RN 90-92 Changing Aptitude Achievement Relationships in Instruction: A Comment, Tobias, S. August 1990. (AD A226 879) Finding of variable relationships between cognitive aptitudes and instructional outcomes were seen as a challenge to the aptitude treatment interaction paradigm. This paper points out that correlations between preceding and succeeding modules were generally as high as those between module outcomes and the 24 cognitive aptitudes. These data lend further support to the variability of the achievement treatment interaction formulation.

RN 90-93 Descriptive Models of Military Decision Making, Klein, G.A.; Thordsen, M.L.; Calderwood, R. August 1990. (AD A226 884) It is important to understand the nature of military decision-making strategies in order to plan for those systems dependent on their effectiveness. This paper reports the results of three studies examining team decision making in the Army. The data suggest that recognitional decision making is much more common than analytical decision making. The strengths and weaknesses of recognitional and analytical decision strategies are viewed and compared, and we describe factors affecting the type of strategy used. Finally, the use of recognitional strategies has

implications for planning, and the paper examines the conditions under which different planning approaches are most effective.

RN 90-94 Signaling the Onset of Nightmares, Breznitz, S. August 1990. (AD A226 943) This study investigates changes induced by the autonomic nervous system that are associated with the onset of nightmares. The study reveals that subjects reporting nightmares fail to reproduce them in the experimental setting. It is suggested that a more systematic investigation using a broader range of subjects and procedures might increase the ecological validity between "real life" and the laboratory setting. Thus, the possibility of autonomic nervous system indices signaling the onset of nightmares remains a possibility.

RN 90-95 Duration Time Analysis of Spouse Employment in the U.S. Army, Lakhani, H.A.; Gilbert, A.C.F. August 1990. (AD A228 329) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report presents a conceptual model of analysis of duration of spouse employment in general, and of Army spouses in particular. The utility of the model is presented in the context analysis of data from the 1985 Department of Defense (DOD) Survey of Spouses.

RN 90-96 Community Satisfaction: Implications for Army Communities, Orthner, D.K.; Devall, E.; Stawarski, C. August 1990. (AD A226 878) Because the quality of a community has a tremendous effect on the lives of its citizens, the Army is committed

to making the Army community a better place for military members and their families to live and work. This paper reviews the literature to summarize the important factors contributing to satisfaction in civilian and military communities.

RN 90-97 Pretesting and Revision of the Survey of Advanced Individual Training Graduates, Houston, J. August 1990. (AD A226 874) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This research pretests and revises a survey questionnaire on family-related factors for administration to advanced individual training (AIT) graduates. The survey was administered to 205 soldiers (41 at Fort Dix, 44 at Fort Jackson, and 120 at Fort McClellan) in five military occupational specialties (MOS): 54B, 64C, 76Y, 94B, and 95B. After administration of the surveys, feedback sessions were held to discuss clarity of items, administration instruction, and item content. Data were analyzed to evaluate completion time, appropriateness of item content, clarity, and error rates. The findings were used to revise the survey and the administration instructions.

RN 90-98 Spouse Employment User Summary, Coolbaugh, K.; Perrine, H.S.; Griffith, J.D. August 1990. (AD A226 877) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: *The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy

options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report is an easy-to-read document that illuminates the issue of spouse employment for the Army. It traces why spouses are employed or not employed, why they work, what they earn, what they do, and the barriers they find when seeking employment. It describes organizational programs and policies that assist spouses in finding employment and outlines research questions being addressed by the Army Family Research Program.

RN 90-99 Social Science Research and Literature on the Contemporary Military in Socialist States, Bebler, A. August 1990. (AD A226 925) A number of problems exist within the body of social science literature and research on the contemporary military in Socialist/Communist states. Much of this research is nonscientific in nature, and what is of interest is often unavailable to even social scientists. Organizational differences set aside Communist from Western militaries in the areas of social science research and publication. Many social science research institutions in the East are institutes of military history. There is strict separation of civilian social scientists from military personnel involved in social science research. Practically the entire production of social science work comes from military institutions and authors. Only a fraction of this goes unclassified. The share of scientific content in this literature varies widely—from zero to, exceptionally, above half.

RN 90-100 Evaluation of a Method of Verbally Expressing Degree of Belief by Selecting Phrases From a List, Hamm, R.M. August 1990. (AD A226 908) This report describes a method for verbal expression of degree of uncertainty. The method requires the subject to select a phrase from a list that spans the full range of probabilities.

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In a second, optional step, the subject indicates the numerical meaning of each phrase. Alternative list orders were compared to determine the effects of presenting the phrases in ordered sequence or randomly. When the verbal expressions were arranged in random order, ordinal position had a significant effect on the selection of expressions, and the preference for phrases with broader ranges of meaning was stronger in the second half of the list. However, these effects did not occur when the phrases were listed in ascending or descending order. Considerations of accuracy and interpersonal agreement also support the use of ordered phase lists.

RN 90-101 Dual-Military Enlisted Couples, Janofsky, B.J. August 1990. (AD B148 733) In 1985, approximately 400 dual-military enlisted personnel were surveyed to address family concerns and career intentions. This report documents the results of that survey. It examines, and where appropriate, contrasts the family and career attitudes of male and female personnel. Consistent with prior research results, enlisted females in dual-military couples are more likely than enlisted males to report both more limited Army career intentions and greater concerns with marriage and family issues. For both men and women, joint domicile is a major issue related to their career decision making. Pregnancy and child care are two issues of greater concern to women than men. Overall, enlisted dual-military couples feel positively about their work and parallel the concerns of dual-career couples in the civilian sector.

RN 90-102 The Army Family Research Program: Program Development Increment Package Defense Information and General Officer Steering Committee Materials, Research Triangle Institute. August 1990. (AD A226 889) The Army Family Research Program (AFRP) has provided support to the U.S. Army Commu-

nity and Family Support Center (CFSC) for several research utilization activities, including the defense of the Program Development Increment Packages (PDIPs) in November 1987 and for briefing to the CFSC General Officers Steering Committee (GOSC) in April 1987. This document contains materials prepared for these activities, as well as copies of associated memoranda and other documentation. These are provided as reference materials that may be used for other applications and as documentation of the work undertaken. The attached materials are divided into two parts, with the PDIP defense material presented as part I and the April 1987 GOSC materials as part II.

RN 90-103 The Army Family Research Program: Second Annual Work Plan, Cruze, A.M. August 1990. (AD A226 891) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report describes the planned activities of this research for the second year of the effort and is organized into four general areas: (1) family adaptation (addressing the concept of community and wellness); (2) family factors and retention; (3) family factors and readiness; and (4) spouse employment.

RN 90-104 Final Report: Optimizing the Long-Term Retention of Skills: Structural and Analytic Approaches to Skill Maintenance, Healy, A.F.; Ericsson, K.A.; Bourne, L.E., Jr. August 1990. (AD A226 130) This research program seeks to identify the characteristics of knowledge and skill which are most resistant to de-

cay due to disuse. Our research can be divided into two complementary parts. The first part is concerned with experimental analysis of factors influencing and improving retention of skill components. The second part is concerned with analysis and assessment of the structure of acquired memory and skills and how to monitor differential retention of components. For the analytic approach we developed five laboratory methodologies, and we completed investigations for each of them. We also identified four natural skills and completed investigations for each of them. For the structural approach we designed an experimental paradigm which allows us to assess the detailed encoding of new knowledge at presentation and at delay using verbal report techniques and chronometric measurement of retrieval components. Several studies of retention of vocabulary items were completed. In a number of our lines of investigation, we found evidence for a surprising degree of long-term skill retention. We formulated a theoretical framework, focusing on the importance of procedural reinstatement, and this framework enables us to understand this impressive memory performance. In contrast, in other studies we have conducted, we found considerable forgetting over even relatively short retention intervals. We have been able to place these studies in the same general theoretical framework developed to account for permastore, and we have been able to derive from these studies indications of the specific factors which facilitate retention. This document also includes two reports: (1) Optimizing the Long-Term Retention of Skills: Analytic and structural Approaches to Skill Maintenance: Review of Progress on Analytic Approach by Alice Healy and Lyle E. Bourne, Jr., and (2) The Long-Term Retention of Skills by Alice F. Healy, David W. Fendrich, Robert J. Crutcher, William T. Wittman, Antoinette T. Gesi, K. Anders Ericsson, and Lyle E. Bourne, Jr.

RN 90-105 Implications of Wellness Models for Educational and School Psychology, Tobias, S. August 1990. (AD A226 128) This paper discusses some problems with health treatment models, and the importance of conceptualizing concerns about health from a "wellness" model perspective. The implications of wellness models for psychologists working in the schools are then discussed. Finally, a function would be to assist the school by educating competent youngsters rather than conduct remediation, treatment, or individual evaluation programs. Some examples are described of functions such psychologists could perform in the schools, including the following: Implementing behavior modification procedures, training teachers in reading comprehension, conducting test anxiety reduction and study skills training programs, and others. Some general characteristics of such roles are also discussed.

RN 90-106 Test Anxiety and Post Processing Interference, Tobias, S. August 1990. (AD A226 194) This study examined whether test anxiety interfered with retrieval of prior learning, or instead if defective study skills lead to poor acquisition. In a free recall list learning paradigm 69 students learned a list of 18 words composed of three categories to a criterion of perfect recall. A similar second list was exposed for three trials. The results provided clear-cut evidence for interference in the retrieval of prior learning by test anxiety and weaker evidence for the influence of study skills. Study skills were unrelated to acquisition indices.

RN 90-107 Causal Models in the Acquisition and Instruction of Programming Skills, Reiser, B.J. August 1990. (AD A226 206) This interim report summarizes the progress we have made on the GIL intelligent tutoring system and the GLEE discovery system for the instruction of programming skills. We describe the current

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status of these computer systems and the experiments investigating the role of explanations in learning and the use of graphical representations to facilitate problem solving. We also describe the Bat Book problem solving environment for the study of analogies in programming, and our studies of effective human tutors.

RN 90-108 The Army Family Research Program: First Annual Work Plan, Research Triangle Institute. August 1990. (AD A226 140) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report describes the planned activities of the contract portion of this research for the first year of the effort in five general areas: (1) identification of families that are adapted to Army life and the mechanisms to support them; (2) retention; (3) family factors and readiness; (4) spouse employment; and (5) project integration.

RN 90-109 Test Anxiety: Cognitive Interference or Inadequate Preparation, Tobias, S. August 1990. (AD A226 195) This paper reviews the differences between two interpretations accounting for the poor test performance of highly anxious students: 1) that anxiety interferes with retrieval of prior learning, or 2) that, due to study skills deficits, the initial acquisition by an anxious student is less thorough than that of a less anxious student. Research results dealing with both hypothesis are reviewed. It was concluded that these were complementary rather than mutually exclusive formulations. A hypothesis was advanced predicting that test

anxiety debilitates performance by reducing the cognitive capacity available for task solution, and that study skills facilitate learning by reducing the cognitive capacity demanded by different tasks.

RN 90-110 Building Strong Army Communities, Orthner, D.K.; Pollock, D.L.; Early-Adams, P.; Devall, E.; Giddings, M.; Morley, R. August 1990. (AD A227 866) The Army Family Research Program (AFRP) is a 5-year integrated research program which supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) through the development of databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report which is based on an extensive review of the literature identifies factors which contribute to the well-being of military families and communities and those programs that are effective in helping families and soldiers to cope. A strong community is defined as one in which individual, family and community needs are met. These needs are addressed through both informal and formal support systems. The components of a strong community include: (1) informal support systems that allow personal relationships to develop; (2) community leaders who allow members to influence their decisions and who are responsive to family needs; (3) support services that are of sufficiently high quality; (4) a work environment that provides security and satisfaction; (5) a physical environment that is pleasant and encourages pride; and (6) support programs that are of high quality and well known to community members.

RN 90-111 The Influence of Family Factors on the Retention Decision Making Process of Military Members, Bowen, G.L. August 1990. (AD A226

948) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. Using an inductive theoretical approach, this report describes the development of a model to identify how and under what condition family factors have been found to impact upon the retention decision making process of military members. Despite the growing body of literature on the influence of family factors on the retention, decision making process, a number of conceptual and methodological issues to plague the research that seriously restricts efforts at conceptual and theoretical integration. Despite its limitations, the model offered is based on an empirical integration of the research literature, and should have heuristic implications for continued research in this important area of policy and program research.

RN 90-112 The Object Display in Decision Making and Judgment,

Barnett, B.; Goettl, B.P.; Kraemer, A.F.; Wickens, C.D. August 1990. (AD A227 059) This paper presents three experiments which apply the principle of compatibility of proximity to multicue decision making and judgment. This principle states that when a task requires the integration of information, the display should present the data in close proximity. When, however, the information must be selectively attended or processed, the information should be displayed with low proximity. In the first experiment, subjects processed information cues in a multicue decision making task. The cues varied in their source, diagnosticity and reliability. They were presented either as separate bargraphs, or as rectangles. Their presentation was either simultaneous

or sequential. The results indicated that greater proximity in time (simultaneous) and objectness (rectangular cues) lead to improved judgments. Furthermore, the rectangular format did not disrupt the memory for isolated cue values. In experiments 2 and 3, subjects were shown three numerical values and were required to combine them to predict a criterion value. Both the equation relating the cues to the criterion and the display format of the cues were varied. Experiment 2 demonstrated that when the cues had to be selectively attended, performance was better with a bar-graph display than with an integrated triangle display. No difference was observed when all the cues had to be integrated. Experiment 3 demonstrated that the effects of display format are contingent upon the relation between the cues and the criterion. Discussion centers on display format and perception of relations between numerical data.

RN 90-113 The Evaluation of Long Range Consequences in Decision Making, Busemeyer, M.K.S. August 1990. (AD A226 949) The purpose of this research program is to develop a general model of how individuals make decisions that involve temporally remote or long range consequences. The primary focus of this project is to define the form of the subjective time scales as they vary across situations and individuals, to define the type of discounting operation that is used to qualify incentives when they occur in the future, and to test the way that these processes can be analyzed using different tasks or response measures. A measurement model has been used as a framework for investigating the way subjects respond to long-term positive and negative consequences. All five of the experiments described in the proposal were completed. This summary report will provide an overview of the progress made toward the objectives defined for this phase of the research program.

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RN 90-114 How It Works: Some Recent Developments in the Pursuit of Academic Excellence, Kornheim, S.; Ruskin, R. September 1990. (AD A226 876) Loosely based on the popular booklet, "What Works" published by the Federal Government in 1986, "How It Works" reviews some of the latest research findings in key issues of academic excellence. The first section, "Home," addresses the impact and importance of introducing limited educational programming in the home including the role of parental support, early reading, and assigned homework. "Classroom," the second section, presents specific issues germane to the dynamic interaction between students and teachers: classroom management, student motivation, student-centered classes, and study skills. The third and final section, "School," takes a broader view of academic achievement by examining topics that require much more investigation and scrutiny than they have received to date: The role of principals, curriculum improvement, and school evaluation.

RN 90-115 Innovative Instructional Strategies: Successful Learning Systems for Military and Civilian Educational Environments, Ruskin, R.; Kronheim, S. September 1990. (AD A229 091) Innovative Instructional Strategies (IISs) are teaching systems based on principles of operant conditioning. They directly reinforce work, immediately feedback knowledge of results to students, and structure the learning environment so that student control and decision making is optimized. Four strategies "Personalized System of Instruction," "Feedback Lecture," "Guided Design," and "Microteaching" are selected for review and recommendation for continuing basic educational research. Each advanced technology that corresponds with a specific innovative strategy and is partly responsible for its successful implementation, is presented. Implications for military settings are discussed.

RN 90-116 Embedded Training in the Polaris SSBN Missile Fire Control System, Annett, J. September 1990. (AD A227 062) Embedded training is a special facility built into operational equipment to permit its use for training purposes. This report provides a retrospective summary of the use of an embedded training facility in the Polaris Submarine Missile Fire Control System. A special embedded device, the Training Alarm Control Console (TAC), used in conjunction with the Fire Control Console and other operational equipment, permits the fire control team to rehearse missile countdown, including procedures for dealing with fault conditions, under realistic conditions during long sea patrols as a supplement to training on shore-based simulations.

RN 90-117 Institutional Violence: Organizational and Psychological Issues in the Military Context, Johnson, R.W. September 1990. (AD A227 060) This final report examines the organizational and psychological dynamics of institutional violence in general and as they apply in the military context. Reviews of the relevant literature led to the following three implications for further research and policy development: 1) civic education promoting military and national awareness; 2) training that promotes habitual performance and builds an "esprit de corps"; and 3) unitization, which is to say, the training and development in stable units.

RN 90-118 Review and Analysis of the Military Occupational Specialty (MOS) Restructuring Problem, Akman, A.; Haught, D. September 1990. (AD A227 061) In 1988, the U.S. Army Signal Center requested that Army Research Institute (ARI) initiate a focused examination of Military Occupational Specialty (MOS) restructuring issues existing within the Army's Signal Branch. This research note defines a procedural baseline with respect to existing

policy, current practices, past research, and identifies possible high impact opportunities for developing systematic and quantitative techniques supporting MOS restructuring studies. This research note also assesses the potential applicability of expert systems to MOS restructuring analysis activities. The findings of this first effort may be used to set the course and initiate further efforts that will ultimately ease the burdens of the Army's personnel proponents in terms of MOS restructuring.

RN 90-119 The Object Display: Principles and a Review of Experimental Findings, Wickens, C.D. September 1990. (AD A226 883) This report summarizes and integrates the results of several experiments that have been conducted during the contract period comparing object displays of multidimensional information with more conventional bargraph displays. The context in which this summary is presented is a theory of information integration which proposes that the benefits of object displays will be enhanced to the extent that information from multiple channels must be integrated, and will be diminished to the extent that separate channels must either be processed independently, or information in certain channels must be filtered out. The experiments described involve rectangular, triangular, pentagon and single point objects, conveying data in paradigms related to statistical data analysis, decision making, and process control. The results generally support the theory of an object display benefit for integrated information; furthermore they indicate that the object display effects are independent of the degree of correlation between variables.

RN 90-120 Information Extraction From Visual Displays and the Event-Related Brain Potential, Wickens, C.D.; Bosco, C.; Mane, A.; Kramer, A.; Coles, G.H.; Donchin, E. September 1990. (AD A227

063) Three experiments, of increasing levels of complexity, are reported which examine two questions: (1) Will subjects extract more information from progressively more information stimuli in a probabilistic state-estimation task, as inferred from reaction time measures? (2) Will the amplitude of the P300 component of the event-related brain potential, reflect the amount of information extracted? The three experiments used different versions of a process monitoring task in which the process could be in one of two states, and information bearing on the expectancy of one state or the other was conveyed by discrete informative cues. Occasional probes signalled imperative responses to the expected or unexpected states. The data indicated that in the simplest version of the task with only two levels of information value (Experiment 1), both questions were answered affirmatively. In the more complex version with three levels (Experiment 2), one-half of the subjects performed in a manner consistent with the affirmative answers. In the most complex version (Experiment 3), in which information cues were spatially separated, and system states were autocorrelated, subjects did not extract information differentially from the different cues. The results are interpreted in terms of models of P300, decision effort and their applied implications for system design.

RN 90-121 Concept for a Common Performance Measurement System for Unit Training at the National Traiing Center (NTC) and With Simulation Networking (SIMNET) Platoon-Movement to Contact, Kerins, J.W.; Atwood, N.K. September 1990. (AD A226 719) This report presents a concept for the design of a common performance measurement system for unit training at the National Training Center (NTC) and with Simulation Networking (SIMNET). The report uses Platoon-Movement to Contact as the vehicle for presenting this measurement concept. The concept has

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been extended to a total of six Platoon and Company missions.

RN 90-122 Concept for a Common Performance Measurement System for Unit Training at the National Training Center (NTC) and With Simulation Networking (SIMNET) Platoon-Defend, Kerins, J.W.; Atwood, N.K. September 1990. (AD A226 720) This report presents a concept for the design of a common performance measurement system for unit training at the National Training Center (NTC) and with Simulation Networking (SIMNET). The report uses Platoon-Defend as the vehicle for presenting this measurement concept. The concept has been extended to a total of six Platoon and Company missions.

RN 90-123 Concept for a Common Performance Measurement System for Unit Training at the National Training Center (NTC) and With Simulation Networking (SIMNET) Platoon-Hasty Attack, Kerins, J.W.; Atwood, N.K. September 1990. (AD A226 721) This report presents a concept for the design of a common performance measurement system for unit training at the National Training Center (NTC) and with Simulation Networking (SIMNET). The report uses Platoon-Hasty Attack as the vehicle for presenting this measurement concept. The concept has been extended to a total of six Platoon and Company missions.

RN 90-124 Army Spouse Employment Literature Review, Research Triangle Institute. September 1990. (AD A226 885) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990)* by developing databases, models, program evaluation technolo-

gies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report provides an integrated review of the available literature on spouse employment. Specifically, it covers the effects of aspects of Army life on spouse employment, and the relationship of spouse employment to key family and military outcomes. The literature is reviewed from several disciplines including economics, sociology, and psychology.

RN 90-125 Community Support Programs: Review of the Literature, Orthner, D.K.; Early-Adams, P.; Pollock, D.L. September 1990. (AD A227 550) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990)* by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report provides a review of the literature on the impacts of various community and organizational support programs on personnel, family, and organizational outcomes to the extent that evaluation research is available.

RN 90-126 Assessment of Performance Measurement Methodologies for Collective Military Training, Turnage, J.J.; Houser, T.L.; Hofmann, D.A. September 1990. (AD A227 971) This report describes the state of the art in military collective performance measurement methodologies, particularly those used in the Army. The research, which is based on a large literature review, covers past, present, and emerging training systems training systems and performance measurement issues. It discusses problems in collective training research, such

as inadequate definitions of collective concepts, lack of team development models, and difficulties in differentiating between individual and collective skills. Difficulties specifying objectives, conditions, and standards lead to lack of measurement reliability. Reliability issues are discussed in relation to Army Training and Evaluation Programs (ARTEP) and other current training devices (e.g., SIMNET). The conclusions recommend (1) further study of important dimensions of collective training, (2) utilization of critical incidents methodologies to identify fundamental characteristics of effective collective behaviors, and (3) development of reliable, standardized measurement systems that should test the efficacy of surrogate measurement.

RN 90-127 Performance Assessment Capability Feasibility Study,

Brett, B.E.; Allender, L. September 1990. (AD A227 970) This report presents the results and recommendations of the performance assessment capability (PAC) feasibility study conducted by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), Fort Bliss Field Unit for the Directorate of Training Development at the U.S. Army Air Defense Artillery School. Previously, ARI developed a PAC for a research environment and implemented it on a Patriot weapon system tactical operations simulator. The objective of the study was to determine the feasibility of using the ARI-developed PAC as the basis for improved operator performance evaluation in the Patriot training environment. The study was initiated through extensive meetings with representatives from virtually all user groups. Ratings were obtained on the usefulness, the required frequency and timeliness, and the desired format of the ARI PAC measures. Users rated all of the PAC measures as useful and, in addition, requested other specific measures and enhancements such as flexible scenario replay. An analysis of existing data collection software

and an evaluation of PAC implementation alternatives found it is feasible to implement the ARI PAC on the current Patriot trainer or on a future one. Ten specific recommendations were made about the requirements for a complete PAC that includes the user-desired enhancements above and beyond the ARI PAC.

RN 90-128 A Command Post Layout Optimization Model: An Interim Report,

Williams, J.J. September 1990. (AD A228 029) This report documents an ongoing effort to develop a Command Post Layout Optimization Model (CPLOM) that will aid in the design and evaluation of the physical layout of command posts. The CPLOM is being developed in FORTRAN and uses mathematical programming techniques to minimize design deficiencies that hamper the function of a command post. The report also discusses current limitations and future enhancements of the CPLOM.

RN 90-129 Review of High Memory Demand Courses in the Military Intelligence Officer Basic Course

(MIOBC): A Case Study, Marshall, P.H. September 1990. (AD A227 718) For this report, researchers evaluated the training procedures used in the "Soviet Threat" component of the Military Intelligence Officer Basic Course at the U.S. Army Intelligence Center and School. Statistical analyses revealed difficulties with certain components of that course, and also confirmed that performance in this block of instruction was inferior to other blocks in that course. Based on these analyses and interviews and survey data, it was recommended that learning aids be developed, a laboratory section be added, and that a computerized tutorial system be developed. Such a system would not only benefit the immediate acquisition and retention of information, but would also serve as a remedial resource as students progress through the course.

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RN 90-130 A Computer Application to Access Concept Formation Capacity

Hopkins, J.E. September 1990.
(AD B149 253) TRIAL is a computer application written as an experimental tool to assess concept formation capacity. TRIAL consists of a puzzle with three levels of difficulty. At each level the user must estimate how long to draw a vertical bar based upon two given bars. The goal of each puzzle is to achieve a correlation coefficient of 0.8 or higher between the estimate and the correct answer. The source code was written in BASIC and compiled using Borland's BASIC compiler. Supporting software includes TRIAL.FIL to store TRIAL data, TRIALRD to read the data file, and TRIALCP to copy data from one data file into another.

RN 90-131 Behavioral Variability, Learning Processes, and Creativity

Richelle, M.N. September 1990. (AD A228 056) This research investigated properties of behavioral variability in humans. Two categories of independent variables were considered: environmental and cognitive. The investigation suggested that the capacity to vary behavior is limited by the subject's general developmental level, which cannot be confounded with his/her cognitive capacities. The research concluded that variability is an inherent characteristic of behavior.

RN 90-132 The Army Family Research Program: The Research Plan

Barokas, J. (ed.); Croan, G.M. (ed.). September 1990. (AD A228 706) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family* and *The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report presents the plan

for anticipated research activities and discusses anticipated outcomes. A multimethod research strategy is proposed to investigate the relationship among family factors, Army experiences, retention, and readiness. The strategy begins with the development of a comprehensive theoretical framework portraying the relationships among Army, family, work, and community variables. Specifically, the Army organization and community characteristics combine individual soldier and family characteristics to create a series Army experiences, soldier and family values, and expectations. Hypothetically, these will lead to soldier and spouse perceptions of equity between the costs and benefits of Army life. Positive perceptions yield adaptation, Army commitment, retention, and readiness. Negative perceptions lead to impaired soldiering and eventual separation from the Army. Findings from proposed research activities will result in vastly improved knowledge of the impact of Army families and community support programs on retention and readiness. This knowledge will result in specific program and policy recommendations that will help the Army promote family adaptation to and satisfaction with Army family life, ultimately assuring maximum retention of soldiers and readiness of the force.

RN 90-133 Cohesion Research: Conceptual and Methodological Issues

Oliver, L.W. September 1990.
(AD A228 030) A quantitative integration of the cohesion-performance research involving real world groups (Oliver, 1987) revealed a number of issues that made the interpretation of that research problematic. This paper discusses some of these conceptual and methodological issues and offers recommendations based on the issues. Recommendations call for a consensus on a definition of cohesion as well as on a differentiation of cohesion from other constructs and establishment of a database of cohesion instruments. Specific suggestions

are given for developing psychometrically sound cohesion measures. Also strongly urged is the identification of related variables and the delineation of their interrelationships, particularly the cohesion-performance relationships. Guidelines are presented for reporting of research results.

RN 90-134 Exploratory Models of Reenlistment Intentions From the 1985 DoD Survey of Enlisted Personnel, Duntzman, G.H.; Bray, R.W.; Wood, L.; Griffith, J.D.; Ostrove, N.M. September 1990. (AD A228 049) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) *White Paper 1983: The Army Family and The Army Family Action Plans* (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. The purpose of this research was to develop exploratory models of reenlistment intentions and to determine the role that family factors play in the reenlistment decision. Data from a sample of 34,601 enlisted personnel who responded to the 1985 Survey of Enlisted Personnel were analyzed using a weighted least squares solution. The dependent variable for the regression modeling was self-assessed likelihood of reenlisting. The independent variables for the model were selected to represent four broad classes of variables expected to predict reenlistment intentions: individual and family factors, family program variables, military job and career variables, and military environment variables. The squared multiple correlation was .202 for the single model and .214 for the married model. For the single models, the following variables were not statistically significant: sex, location, satisfaction with environment for families, and satisfaction with the three family programs (i.e., youth/adolescent, child-

care, and recreation). For the married model, nonsignificant variables were location, satisfaction with youth/adolescent program, and satisfaction with the childcare program. For both single and married enlisted personnel, military job and career variables are important predictors of self-assessed probabilities of reenlisting. Satisfaction with the military environment as defined by satisfaction with personal freedom and the opportunity to serve one's country are also important predictors, although the effect is somewhat greater for married soldiers than for single ones. Although both single personnel and married personnel with children had higher self-assessed likelihoods of reenlistment than those with no children, the effect of children was greater for singles. For married personnel, satisfaction with the Army environment for families and satisfaction with recreation programs were significant predictors of reenlistment intentions. The effect of location on retention intention was not statistically significant in either model.

RN 90-135 Proposed Method for Military Intelligence Job Ability Assessment, Muckler, F.A.; Seven, S.; Akman, A. September 1990. (AD A228 709) In 1987, the U.S. Army Intelligence Center and School (USAICS) requested that the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) investigate a number of military occupational specialty (MOS) issues related to the development and introduction of new intelligence/electronic warfare (IEW) collection and processing systems. One problem is the need to develop an in-depth taxonomy that can identify and assess the abilities and skills associated with military intelligence (MI) MOS and new IEW systems, in short a "Job Abilities Assessment System (JAAS)." Based on the Manual of Ability Requirements Scales (MARS), the JAAS method described here can evaluate 52 different abilities and skills appropriate to MI jobs and tasks. The

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method was applied by 13 raters to two MI MOS: 96H (Aerial Intelligence Specialist) and 97E (Interrogator) and demonstrated high inter-rater reliability and coherent profile patterns. Further, the method was used to assess abilities and skills requirements for the Unmanned Aerial Vehicle (UAV).

RN 90-136 Canceled.

RN 90-137 Command and General Staff Officer Course (CGSOC) Student Evaluation of the Tactical Planning Workstation, Riedel, S.L. September 1990. (AD A228 423) The Tactical Planning Workstation is an automated system that supports Army tactical staff performance at the division level. It was developed in the Experimental Development, Demonstration, and Integration Center at the U.S. Army Research Institute Fort Leavenworth Field Unit as a platform for prototyping staff information and decision aids and conducting research on staff performance. See Flanagan and Fallesen (in preparation) for a description of the capabilities of the system and Packard, McClanahan, Zarse, and Ross (in preparation) for a software description. This paper documents an evaluation of the Workstation that was conducted to obtain preliminary feedback from potential users on key design features. Students of the Command and General Staff Officer Course (CGSOC) at Fort Leavenworth provided data for the evaluation. The students made favorable comments about the ease of use of the Workstation, especially when compared with the Maneuver Control System interface.

RN 90-138 A Measurement Concept for Assessing Corps Performance, Pence, E.C.; Welp, R.L.; Stenstrom, D.J. September 1990. (AD A228 275) This report introduces a measurement concept for assessing the performance of an Army corps participating in a joint exercise such as those conducted by the U.S. Readiness Command

(REDCOM). The operational objectives for corps-level organizations are identified through the review of the most recent Army doctrine and interviews with subject matter experts (SMEs) working on corps-level doctrine. Based on current doctrine, interviews with military SMEs, and a review of existing performance measurement systems, an information processing model of corps performance was developed. From this, data collection procedures and a measurement concept was developed initially and evaluated through application in the analysis of the Inchon Landing Operation conducted during the Korean War. The measurement concept, data collection procedures, and validation plan presented in the report provide the blueprints for the development and validation of a corps performance measurement system that could be implemented using the REDCOM Joint Exercise Simulation System (JESS). This performance measurement system could then serve as the vehicle for providing feedback to participants in the REDCOM exercises.

RN 90-139 Data Elements for Workload Analysis of Armored Vehicle Crews

Sidorsky, R.C. September 1990. (AD A228 422) The Task Analysis and Workload (TAWL) methods developed by the U.S. Army Research Institute Aviation Research and Development Activity (ARIARDA) for helicopter workload analysis was used as a model to develop AVTAWL (Armored Vehicle Task Analysis and Workload) methods for the analysis of workload for armored crews. An exhaustive search of relevant documentation was performed to identify all workload elements related to armored operations. The data elements identified in this paper provide a comprehensive vocabulary for interrogating personnel who are subject matter experts (SMEs) in armored operations. Such interrogation of SMEs would comprise the inputs to the AVTAWL software program and provide system developers with an operational M1 tank baseline

for predicting the workload impact of various vehicles included in the Armored Systems Modernization program.

RN 90-140 Army Command and Control Evaluation System (ACCESS) Review, Keene, S.D.; Michel, R.R.; Spiegel, D.K. September 1990. (AD A229 311)

The Army Command and Control Evaluation System (ACCES) was developed as a performance measurement tool for division and corps command and control. To date, ACCES has been applied to one corps and six division exercises. This report reviews the data across all division applications of ACCES and points out patterns and trends that may be significant to the whole Army. It also assesses the ACCES measures themselves, so that improvements can be made in future applications. ACCES shows great promise for becoming highly useful, not only as a measurement tool for command and control training, but also as a means of evaluating physical and operational changes in command post environment. When the data base of ACCES applications has grown somewhat, it will be useful for further development of lessons learned from division and corps training exercises.

RN 90-141 Time Utilization Among Morse Code Trainees: 1989 Survey, Knapp, B.G.; Hagerdon, R.A. September 1990. (AD A229 405)

This research analyzes how student trainees in the entry-level Morse code operator course perceive and utilize their time in a typical 24-hour period. The objective was to determine the relationship, if any, between student time expenditures in various activities, and academic performance. Also of interest were inter-service and training shift differences in time expenditures, and whether time satisfaction was critical to performance. Findings indicated that, although certain variations exist among services and shifts, these do not relate to academic attrition. Also, findings indicate that those groups who

are most satisfied with their time often experience high attrition.

RN 90-142 Interim Report: Developing Training and Systems Solutions for Combat-Critical Tasks, Osborne, A.D.; Mullenix, L.S. September 1990. (AD A228 424)

This interim report summarizes the research support provided by Litton Computer Services to the U.S. Army Research Institute for the Behavioral and Social Sciences, Fort Benning Field Unit, Fort Benning, Georgia, during the period January 1988 through March 1990. The areas of research addressed were Training and Tactical Development for Light Infantry Readiness and Special Operations; Land Navigation Training and Positions Systems; and Weapon Systems Training, which included marksmanship instruction, MANPRINT, and marksmanship devices. The results of this research effort are contained in 45 reports and products.

RN 91-01 Task Analysis and Workload Prediction Model of the MH-60K Mission and a Comparison With UH-60A Workload Predictions; Volume II: Appendixes A-G, Bierbaum, C.R.; Hamilton, D.B. October 1990. (AD A228 947)

For this research, a mission scenario was used to conduct a comprehensive task analysis for MS-60K operations. The analysis used a top-down approach to identify 5 phases, 15 segments, 71 functions, and 230 tasks for the mission. Also, the crewmember performing each task was identified, and estimates of the task duration and the sensory, cognitive, and psychomotor workload associated with the tasks were derived. The mission/task/workload analysis data were used to develop a computer model of workload for the MH-60K crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining tasks into functions and functions into seg-

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ments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-60K pilot and copilot was compared to the UH-60A baseline workload prediction to determine the impact of the MH-60K advanced technology. The comparison indicated very little difference in the predicted workload for the pilot and lower predicted workload for the copilot in the MH-60K.

RN 91-02 Task Analysis and Workload Prediction Model of the MH-60K Mission and a Comparison With UH-60A Workload Predictions; Volume III: Appendixes H-N, Bierbaum, C.R.; Hamilton, D.B. October 1990. (AD A229 408) For this research, a mission scenario was used to conduct a comprehensive task analysis for MH-60K operations. The analysis used a top-down approach to identify 5 phases, 15 segments, 71 functions, and 230 tasks for the mission. Also, the crewmember performing each task was identified, and estimates of the task durations and the sensory, cognitive, and psychomotor workload associated with the tasks were derived. The mission/task/workload analysis data were used to develop a computer model of workload for MH-60K crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining tasks into functions and functions into segments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-60K pilot and copilot was compared to the UH-60A baseline workload prediction to determine the impact of the MH-60K advanced technology. The comparison indicated very little difference in the predicted workload for the pilot and lower predicted workload for the copilot in the MH-60K.

RN 91-03 Test Analysis Program Evaluation: Item Statistics as Feedback to Test Developers, Legree, P.J. October 1990. (AD A229 851) The test analysis program was evaluated to determine the feasibility of using a personal computer to provide course developers with item statistics. This project was undertaken because of Signal School concern that course tests do not accurately measure student school performance. The evaluation focused on the usefulness of providing item statistics to course test developers and demonstrated that many of the tests contain poorly written items. The evaluation indicated that a computerized test analysis program can be used to identify questionable test items and help ensure Signal School tests are adequate to validate lessons and courses.

RN 91-04 Optimization of Simulation-Based Training Systems: User's Guide, Gilligan, E.L.; Elder, B.L.; Sticha, P.J. October 1990. (AD A229 811) This guide provides an overview of the Optimization of Simulation-Based Training Systems (OSBATS) model and prototype software as applied to an artificial but realistic problem related to Army Aviation training. OSBATS was developed to aid in the design and evaluation of training devices that meet training requirements at the minimum cost or maximum training effectiveness. The goals of this guide are (a) to illustrate the kinds of solutions to training-system design problems that OSBATS can provide, (b) to demonstrate the ways in which the model components interact to produce solutions, (c) to describe the operation of the prototype OSBATS software and rule bases, and (d) to illustrate how an OSBATS-like model could support the decision-making process. The guide describes the operation of the OSBATS software, concentrating on how the results of different calculations can be integrated to support the concept-formulation process and providing

the information required to familiarize the user with the installation of the software, the software functions, and the operation of the rule bases.

RN 91-05 Prototype Specifications for an Automated Position Data Analysis Job Aid, Haught, D.; Akman, A.

October 1990. (AD A229 312) Position data analysis are among the most difficult activities performed during operations-based MOS restructuring. This report documents the prototype specifications for a position data analysis job aid. The job aid is a personal computer-based system that can be used to support the assessment of MOS environmental, structural, and deployment data during the position data analysis process. The findings of this report can be used to create prototype software.

RN 91-06 Short Range Air Defense (SHORAD) Engagement Performance Criteria Development and Validation, Barber, A.V. October 1990.

(AD A229 197) The purpose of this research was to validate and calibrate performance criteria for Short Range Air Defense and summary engagements for use in the training, evaluation, and qualification of Career Management Field 16 Series soldiers. In 1989, engagement performance criteria were subjected to multiple field test experiments using the Realistic Air Defense Engagement System (RADES) and the Range Target System (RTS). Participants were soldiers using the Stinger, Chaparral, and Vulcan air defense weapons. Engagement performance varied as a function of experience level, scenario difficulty level, and individual differences in ability and personality. These results enable the fine tuning of performance and scenario difficulty criteria. Performance standards are proposed.

RN 91-07 Executive Thinking and Decision Skills: A Characterization

and Implications for Training, Laskey, K.B.; Leddo, J.M.; Bresnick, T.A. October 1990. (AD A230 218) Managing an organization as large and complex as the U.S. Army requires leaders of the highest caliber. Previous research has shown that leaders at the executive level, corresponding in the Army to three-star general officers and above, think and plan in ways that are qualitatively different from officers at lower levels. This report describes the development of a theory of the cognitive structures that support executive-level functioning. A key theoretical tenet is that the primary discriminator of executives is how their knowledge is organized and accessed. Researchers reviewed literature and non-executive problem solving. Researchers developed a theory of the cognitive underpinnings of executive performance and constructed a set of recommendations for executive development on the basis of the theory.

RN 91-08 Army Synthetic Validity Project: Report of Phase II Results, Volume II: Appendices, Wise, L.L.; Peterson, N.G.; Huston, J.; Hoffman, R.G.; Campbell, J.; Arabian, J.M. October 1990. (AD A229 835) This volume contains tables of supplementary data and results of the Phase II Synthetic Validation Project (ARI Technical Report 892, June 1990).

RN 91-09 Army Synthetic Validity Project: Report of Phase II Results, Volume III: Research Instruments, Wise, L.L.; Peterson, N.G.; Huston, J.; Hoffman, R.G.; Campbell, J.; Arabian, J.M. October 1990. (AD A229 871) This report contains the data collection materials for the Phase II Synthetic Validation Project (ARI Technical Report 892, June 1990).

RN 91-10 Construction of Military Intelligence Military Occupational Specialty Taxonomy, Muckler, F.A.; Seven, S.; Akman, A. November 1990. (AD A230

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197) In 1987, the U.S. Army Intelligence Center and School (USAICS) requested that ARI investigate a number of military occupation specialty (MOS) issues arising from the development and introduction of new Intelligence/Electronic Warfare (IEW) collection and processing systems. A missing component of this research has been the development of an indepth taxonomy of the psychological processes and factors associated with each military intelligence (MI) and career management field (CMF). This research note describes a taxonomy developed to assess the suitability of MOS to meet the job performance demand so the introduction of new IEW systems. The taxonomy has three major levels: job-level assume a sequential process that starts with micro-level evaluation where the impact on MOS aggregates and CMF can be measured. The research notes describes the technical approach and applies the taxonomy in describing the MOS of the 96 CMF.

RN 91-11 Refinement of the Computerized Adaptive Screening Test,

Wise, L.L.; McHenry, J.J.; Chia, W.J.; Szenas, P.L.; McBride, J.R. November 1990.

(AD A231 437) The Computerized Adaptive Screening Test (CAST) is used for predicting performance on the Armed Forces Qualification Test (AFQT). The goal of this project is to expand the existing item pool, balance usage of the test items, improve score reporting, and allow the item pool to be updated periodically. Existing items were reviewed, and new items were developed. Both new and existing items were administered to a sample of 20,000 newly enlisted soldiers and to another sample of 3,500 prospects. The results showed that (a) the new items had good psychometric properties, (b) a limited number of items were biased (and were eliminated), and (c) the test was valid overall, and fair for blacks and females. A number of software enhancements were implemented. To prevent item overuse, the software was modified to prevent selection from a

subset of initial items and to sample items organized into strata according to item difficulty. CAST will now produce test results that show probabilities of attaining scores in the AFQT category scores of 1-3A, 3B, or 4-5. Software implementations also included provisions for adding experimental items and collecting item calibrations data.

RN 91-12 Instruments for Evaluating the Intervehicular Information System,

DuBois, R.S.; Smith, P.G. December 1990. (AD A231 398) This research note includes copies of all test instruments used in a recent U.S. Army Research Institute-sponsored evaluation of the Intervehicular Information System (IVIS) using the Simulation Networking Developmental (SIMNET-D) test bed. IVIS is a computerized command, control, and communication (C3) system proposed for the Block II M1 Abrams tank. This report is a companion report to an ARI technical report describing the actual IVIS evaluation (i.e., Du Bois & Smith, in preparation).

RN 91-13 The Optimization of Simulation-Based Training: Model Data Collection and Utilization,

Willis, R.P.; Guha, P.; Hunter, D.; Singer, M.J. December 1990. (AD A231 436) The goals of this effort were (1) to develop a method for collecting necessary internal, resident data and constructing rules for Optimization of Simulation-Based Training Systems (OSBATS) models; (2) to specify and develop a system for managing the data elements and formats for the residents database; and (3) to collect, convert, and enter data and rules in the recommended database system as a prototype demonstration. The data collection method that was developed centered on interviews and survey questionnaires that could be used to acquire the detailed information was constructed and loaded with the existing and newly gathered information. Researchers concluded that the information could be collected

with great effort, and stored in a database for use by the models. Several problems in the separate implementation of decision aid (OSBATS) and database were identified. The use of survey information for rule construction was illustrated, and the potential for expanding OSBATS was presented.

RN 91-14 Human Performance Concerns for the TRACKWOLF System,

Knapp, B.G.; Hall, M.J. December 1990. (AD A231 359) This report presents findings from site visits to two operational systems (OUTS and TRACKFINDER), which are predecessors to the objective TRACKWOLF system under development. The purpose of the site visits was to obtain "lessons learned," operator workload estimates, and critical high-driver tasks. These data were used as a baseline for comparing operator capabilities and as a precursor to use in TRACKWOLF operational tests. Findings indicated significant frustrations with equipment operations and communication capability of OUTS and TRACKFINDER. This was also revealed by a high rating on the workload scale (NASA-TLX) on frustration and temporal demand subfactors. Over 50% of the tasks were judged high workload and difficult cognitive load for operators. Results have been provided to proponent combat developer and trainer personnel.

RN 91-15 Formulative Evaluation Study of a Prototype Near-Infrared Projection System: Night Vision Goggle Study,

Pedroni, G.M.; Intano, G.P. January 1991. (AD A231 759) U.S. Army Aviation relies upon image intensifiers, such as night vision goggles (NVGs), for night nap-of-the-earth (NOE) flight. During initial flight training, OH-58 student pilots are expected to apply academic knowledge of NVG use in flight after limited review. To facilitate OH-58 students' transition to NVG flight, researchers projected images through a proto-

type near-infrared (IR) video projection system. Students received hands-on experience with the AN/PVS-5A NVGs, which are compatible with the projection system's output range. Instructor pilots rated OH-58 students' flight performance throughout the night/NVG phase of instruction. A strong positive effect on students' confidence (increase) and anxiety (decrease) levels was observed. No difference in flight performance was observed between matched pairs (experimental vs. control) of students. Additional research is planned in the areas of safety of flight, terrain navigation, special operations, mission planning, and threat recognition.

RN 91-16 Training to Improve the Organization of Tactical Knowledge: An Evaluation of the Armor Tacti-

cal Concepts Tutor, Morrison, J.E.; Drucker, E.H.; Kern, R.P.; Foster, M.W. January 1991. (AD A232 025) The U.S. Army Research Institute sponsored the development of computer-based, interactive video training problems observed in the Armor Officer Basic Course (AOBC). The objectives of the experimental evaluation were to try-out ARTACT in AOBC; to determine its effects on knowledge retention, organization, and processing; and to assess student reactions and perceptions to the system. Sixty student volunteers from five AOBC classes were randomly assigned training on ARTACT in addition to their normal training in AOBC. Students in the control group received AOBC training only. All students were tested on their knowledge of tactics both before and after training on ARTACT. At the posttest, students in the experimental group were also asked for their subjective impressions of ARTACT. Researchers found that—

- While there were large decreases in error rate between pretest and posttest, ARTACT students showed 12% greater improvement than the control group.

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- Both the experimental and control groups showed changes in the types of reasoning expressed during tactical problem solving indicative of increasing tactical expertise. However, no difference was found between the two groups.
- No differences were found between the two groups on class standing or on the Armor School's tactical test scores.
- Students' reactions to incorporating AR-TACT into AOBC were generally positive, but with qualifications for desired improvements.

RN 91-17 The Usefulness of Project A Spatial Tests for Predicting Comprehensive Performance Measures, Busciglio, H.H. January 1991. (AD A232 069) The Army's Project A developed and validated measures of abilities other than the general cognitive domain covered by the Armed Services Vocational Aptitude Battery (ASVAB). Busciglio (1990) analyzed data from the 1985 Concurrent Validation phase of Project A and found that Project A spatial scores substantially incremented the predictive validity of ASVAB. However, a number of questions were left unanswered. How useful are spatial abilities to performance in various entry-level Army jobs? Do spatial remain valid predictors after the ASVAB subtests have been added to prediction equations? Busciglio's (1990) original sample of 4,039 individuals in nine entry-level MOS was again used. Predictors were the ASVAB and Project A spatial tests. Criteria were comprehensive measures of job performance and included written and hands-on tests of common and MOS-specific tasks. Backward stepwise multiple regression analyses were performed to answer the research questions. In comparing the results with those of Busciglio (1990), it was found that the spatial tests accounted for approximately as much criterion variance as did the ASVAB tests, indicating the importance of spatial skills to the performance of many Army jobs. Also, several

of the spatial tests were especially strong predictors of the criterion measures across MOS, suggesting that they would lead to improved prediction of job performance if incorporated into the Army's selection composites. A number of methodological considerations are noted as an aid to interpreting these results.

RN 91-18 Interim Final Report: Developing Training and Systems Solutions for Combat-Critical Tasks, Osbourne, A.D.; Mullenix, L.S.; Louise, S. January 1991. (AD A231 905) This interim final contract report summarizes the operational support provided by Litton Computer Services to the U.S. Army Research Institute for the Behavioral and Social Sciences, Fort Benning Field Unit, Fort Benning, Georgia, from April 1990 through September 1990. The area addressed was Multipurpose Arcade Combat Simulator (MACS) implementation, maintenance, and fielding. The results of this effort are contained in an updated Moving Target Program, Trainers' Guide, and other products.

RN 91-19 Conceptual Models of Unit Performance, Rakoff, S.H.; Laskey, K.B.; Marvin, F.F.; Mandel, J.S. January 1991. (AD A232 743) This report summarizes work testing the usefulness of neural-network models for measuring and predicting Army unit performance in settings such as the National Training Center. A back-propagation neural-network model was developed and trained from wargaming simulation. Results suggest that such a model can train to recognize unit success and failure in simulated engagements. Further work will require access to clean, large, data sets, such as those available from SIGNET. In addition, an expert-based preprocessor is suggested as a useful approach to implementing a model.

RN 91-20 Methods for Providing Direct Feedback About Decision Proc-

esses for Command and Control Classroom Exercises, Thordsen, M.L.; Klein, G.A.; Michel, R.; Sullivan, E. January 1991. (AD A231 760) This report summarizes research that explores the possibilities for providing immediate, real-time feedback to officers in classroom training exercises at the Command and General Staff College at Fort Leavenworth, Kansas. Six issues were addressed by the project: (1) Can team decision strategies be tracked in real-time military command and control exercises? If so, (2) Can direct feedback be provided to the participants? (3) What is the nature job the feedback that can be provided? (4) How quickly can the feedback be provided? (5) Is limitations of the application and what can be done to increase the possibility for a successful application of the techniques? It was determined that team decision strategies can be tracked in real-time military command and control settings and that illustrative and pattern feedback can be provided approximately 30 minutes after completing the exercise. In addition, charts mapping the deepening of an idea and tables of other quantifiable factors can be provided 2 to 24 hours to following and exercise. Several potential limitations as well as factors that can increase the probability for a successful application are discussed.

RN 91-21 The Selection of an Experimental Test Battery for Aviator Cognitive, Psychomotor Abilities and Personal Traits, Intano, G.P.; Howse, W.R.; Lofaro, R.J. January 1991. (AD A231 887) In late 1988, the U.S. Army Aviation Center (USAAVNC) redesigned the Initial Entry Rotary Wing (IERW) course for aviator candidates. The new training is called IERW Multi-Track (IERW-MT) and became operative in May 1988. The research problem for the U.K.S. Army Research Institute Aviation R&D Activity (ARIARDA) was to develop tests and procedures for selecting aviator candidates for one of four helicopters prior to training day 100.

ARIARDA simultaneously pursued two avenues of research. On the one hand, available test instruments were considered and evaluated for their potential to discriminate among aviators. On the other hand, groups of Subject Matter Experts (SMEs) developed criticality-rated aviator candidate abilities and traits for specific operational helicopters. Extensive literature reviews and liaison with sister services and other agencies were accomplished. Four test instruments were evaluated for use. The underlying abilities, traits, and skills these batteries purported to measure matched the abilities, traits, and skills identified as necessary by the SMEs for each of their helicopters. Upon selection of the subtests contained in the ARIARDA experimental test battery, high-time aviators were given the experimental battery to develop scoring profiles for specific aircraft and to generate the data for the statistical analyses that resulted in the Preliminary Multi-Track Classification Algorithm.

RN 91-22 Family Support and Services in the Army's Active Component During Early Stages of Operation Desert Shield, Oliver, L.W.; Bell, S.A. January 1991. (AD A231 886) This report summarized an exploratory investigation of family services and programs supporting the families of soldiers deployed in connection with Operation Desert Shield. The report provides information on the status of such services and programs for the Active Component approximately 2 months after deployment. The findings of the report are based on interviews conducted by an interagency task force at four Army posts. The task force members identified the following major issues related to family needs: (1) uncertainty associated with lack of information concerning the deployment; (2) inadequate financial resources; (3) difficulties concerning child care; and (4) lack of timely and reliable communication with both the Army and the deployed husbands. Re-

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sources available to families of deployed soldiers included formal and volunteer Army and community agencies, as well as relatives and friends of the families. On-post services were often provided through Family Assistance Centers. Rear detachment commands and Family Support Groups played an important role in some locations. Although we cannot generalize these findings, the results reported here will provide direction for a followup of this exploratory investigation.

RN 91-23 USAREUR Personnel Opinion Survey 1986: A Report on Family Issues, Kralj, M.M.; Sadacca, R.; Stawarski, C.; Kimmel, M. January 1991. (AD B 152 789) The Army Family Research Program (AFRP) is a 5-year integrated program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that help the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This research obtained insights into questionnaire and scale development activities for the Army Family Research Program (AFRP) through analysis of USAREUR personnel Opinion Survey 1986 (UPOS-86) items linking family-related issues to measures of retention, readiness, and family adaption. A copy of the UPOS-86 data tape was secured from Headquarters, U.S. Army Europe and Seventh Army (USAREUR), and analyzed by correlational techniques to investigate the psychometric properties of potential scales and by cross-tabulations of outcome measures by family factors to explore potential hypothesis. These analyses were performed separately for each of four survey samples: Two samples of military personnel (N=5823 and N=3274, respectively); one sample of Department of Army (DA) civilian personnel (N=642); and one sample of adult family members

(N=1403). Since the primary purpose of this report is to document exploratory analyses of the data, all results are unweighted, and no attempt is made to generalize findings to USAREUR or other Army populations. Results from the military personnel, DA civilian, and family member surveys provided a rich source of input for the AFRP. Medical, housing, and banking were cited as services most in need of improvement, but the specific deficiencies were not addressed. The AFRP would benefit from survey items that ask about aspects of services of concern to soldiers. A six-item scale asking each soldier to rate his/her state of combat readiness was found to have low reliability, suggesting that self-report may not be the best approach for assessing individual readiness. Present duty assignment and family member satisfaction were among the most often sighted factors influencing decisions about European tours. The nature of these relationships should be a prime focus of future research. "Working conditions" was most often cited as a source of stress for Department of the Army civilians in labor, technical, and professional positions, and "working for the Army" was cited as a major source of stress for those in clerical positions. It is not clear from the survey item what specific aspects of the work environment increased stress. This should be explored in future survey efforts. The Family Member Program and Civilian Personnel Office were among the most frequently cited employment sources for all but professional positions. Results indicated that 40% of the respondents did not know about the community chain of command, approximately 50% found it both easy to contact and support their needs. This finding suggests that future research may benefit from differentiating "knowledge" of services from "use" of those services. The family member survey sample was predominantly female (87%) and employed outside the home (69%). This reinforces the need for a spouse survey as part of the AFRP effort, and suggests that spouse em-

ployment issues should be an important element of that survey. Individuals who reported that their spouse's general satisfaction with the Army than those who felt the commander was not interested. This finding merits further examination. Some definition of differences in activities and policies of commanders likely to influence satisfaction may prove fruitful. Two-thirds of the respondents indicated they had never used the Family Member Employment Assistance Center, and 70% reported that they either did not know about or did not use the One Stop Employment Assistance Center. Further examination of the reasons for these findings is warranted. The Army sponsor for this research, the Army Community and Family Support Center (CFSC), reviewed and approved an earlier draft of this report. Their comments indicate that the contents of this report will be useful in revising Army programs and policies.

RN 91-24 Analysis of the Scope, Functionality, and Usability of the Joint Readiness Training Center Data Base Archive, Nichols, J.J. January 1991.

(AD A232 128) This report presents an overview of the types of Joint Readiness Training Center (JRTC) unit performance data available to the Army training development community and some analysis techniques that demonstrate JRTC data scope, functionality, and usability. The demonstration analysis was performed across seven JRTC rotations for the defensive mission. Computerized O/C checklist data, personnel Battle Damage Assessment (BDA), and unit take home packages were the primary sources of information. The preparation of JRTC data for examination involved procedures that facilitated computerized data manipulation and generation of statistics across multiple rotations within the constraints of a Zenith A-248 computer (the Army standard personal computer). The demonstrational analysis yielded only broad results regarding unit performance in conduct-

ing defense on the JRTC battlefield. However the process of preparing and analyzing JRTC data extracted from the ARI-POM data base archive produced multiple illustrations of both positive and negative aspects of the scope, functionality, and usability of the data base archive. Four recommendations for data base enhancement were made: (1) Develop a unit performance measurement system that facilitates analysis of relationships between tasks; (2) Develop a T&EO schematic that links related or matching subtasks and sub-tasks standards across modified T&EO tasks; (3) Augment data collection system to require annotations when T&EO data conflict with task ratings; and (4) Standardize all JRTC automated file formats. The JRTC data base archive includes a broad spectrum of unit performance information that provides great potential for in-depth post-rotational analysis of light force training and light force training issues. Whether this potential is realized depends on future data collection and data management developments.

RN 91-25 Development of a Combat Service Support Data Collection System for Tactical U.S. Army Training, Hamza, A.N. January 1991. (AD A236 822)

The Army Lessons Program (ALLP) aims to use past Army training and wartime experience to improve combat effectiveness by correcting combat relevant deficiencies in doctrine, training, materiel, organization, and leadership. Unit training data for the Combat Service Support (CSS) Battlefield Operating System (BOS) does not fully support lessons learned analysis. This report describes a methodology and action plan for developing a CSS data collection system using data from the Army Combat Training Centers (CTC) and other training exercises. This R&D project is a cooperative effort with Training and Doctrine Command proponents. The methodology was presented to and supported by the Army logistics community during a workshop. Data re-

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uirements (derived from issues) were identified for each CSS school. For each issue, initial development of supportive critical tasks and measures of performance (MOP) were accomplished. Further, organizations systemically collecting CSS data were presented to the group. The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), U.S. Army Logistics Center (LOGC), and the U.S. Army Combined Arms Training Activity (CATA), Center for Army Lessons Learned (CALL) are action agencies responsible for developing and executing this R&D effort.

RN 91-26 User's Manual: Distributed Training Technology Cost Analysis Templates, Hagman, J.D.; Dykstra, D.I., Jr. January 1991. (AD A235 893) This manual is a guide for the Training Technology Cost Analysis Templates (TTCATS) software program. TTCATS contains seven individual subprograms, or templates, that customize the LOTUS 1-2-3 spreadsheet to help project the cost of delivering training to geographically distributed locations. The cost estimates pertain either to delivery method and equipment configurations that have been independently determined to be appropriate for an anticipated application or to configurations recommended by a companion expert-system-based software program called TECHSE-LECT (See ARI Research Product 88-11). The first six TTCATS templates calculate costs for a variety of distributed training delivery method and equipment configurations: asynchronous delivery via computer-based training with desktop microcomputers, asynchronous delivery via computer-based training with portable or laptop microcomputers, asynchronous delivery via computer conferencing, synchronous delivery via audio conferencing, synchronous delivery via video conferencing with land-based microwave communications, and synchronous delivery via video conferencing with satellite-based communications. The last template calculates the cost of transport-

ing trainees to a central training site. Although TTCATS was developed to address the distributed training requirements of the U.S. Army National Guard and Reserve, its cost estimates apply generally to most nontraditional "classroom" situations in which trainees cannot meet at the same place for training.

RN 91-27 Precision Range Integrated Maneuver Exercise: User's Guide and Videotape, Kraemer, R.E.; Koger, M.E. January 1991. (AD A232 329) This report describes the development of a User's Guide and Videotape of the Precision Range Integrated Maneuver Exercise (PRIME). PRIME is a device-based training system developed by the Project Manager for Training Devices (PM TRADE) to help armor and mechanized infantry units meet their gunnery and tactical training needs. The PRIME User's Guide and Videotape provide unit leaders with training materials to support the integrations of PRIME into unit training programs. The User's Guide provides a written description of PRIME and guidance on how to conduct PRIME training. The Videotape shows how the PRIME system and its subsystems and elements operate.

RN 91-28 Literature Review: Cognitive Abilities—Theory, History, and Validity, Toquam, J.L.; Corpe, V.A.; Dunnnette, M.D. February 1991. (AD A232 638) The research described in this report was performed under Project A, the Army's large-scale, multiyear manpower and personnel effort for improving the selection, classification, and utilization of Army personnel. This report is one of three derived from an extensive literature review to identify constructs that might enhance the accuracy of the Army screening system (the other two reports deal, respectively, with psychomotor abilities and with utility of temperament, biodata, and interests assessment). Researchers identified

and defined the constructs included in the cognitive ability domain and summarized early efforts to measure intelligence and contemporary cognitive ability measures for vocational guidance and prediction of work performance discussed social and legal implications of such measurement. They summarized the validity evidence for traditional psychometric measures. On the basis of the cognitive abilities assessed in four widely used test batteries and two lines of extensive research, a cognitive taxonomy that contains nine ability factors is suggested. These factors are verbal, number facility, spatial abilities, reasoning, memory fluency, perception, perceptual speed and accuracy, and mechanical aptitude.

RN 91-29 Cultural Parameters of Stress,
Clark, V.R. February 1991.

(AD A232 526) This paper discusses the role of culture diversity in the mediation of stress appraisal. First a discussion of mediators, such as ratings of life events and perceived control, is presented. This discussion is followed by a brief discussion of ways in which people of different cultures contend with stress.

RN 91-30 A Model of Family Factors and Individual and Unit Readiness: Literature Review, Campbell, C. H.;

Campbell, R.C.; Ramsberger, P.; Schultz, S.; Stawarski, C.; Styles, M. February 1991.

(AD A232 705) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper of the Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report presents a review of the literature on factors that affect readiness and the strength and causal or moderating role of

these factors. The report discusses a conceptual model of readiness, the definition and measurement of individual and unit readiness, and the definition and measurement of determinants of readiness.

RN 91-31 Inventory of Community Satisfaction and Family Support

Measures, Pollock, D.; Brown, A. February 1991. (AD A232 974) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff for the Army (CSA) White Paper 1983: The Army Family and The Army Family Action Plans (1984-1990) by developing databases, models, program evaluation technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report provides a compilation of community satisfaction measures that have been used in a wide variety of contexts. The compilation is divided into four sections: community satisfaction measures specific community attribute measures, military family/community surveys, and general community surveys. The description of each instrument is accompanied by a copy of the instrument itself or by a sample of the items.

RN 91-32 Definition and Measures of Individual and Unit Readiness

and Family Phenomena Affecting It,

Kralj, M.M.; Sadacca, R.; Campbell, C.H.; Kimmel, M. February 1991. (AD A232 765) The Army Family Research Program (AFRP) is a 5-year integrated research program that supports the Chief of Staff of the Army (CSA) White Paper 1983: The Army Family and The Army Family Actions Plans (1984-1990) by developing databases, models, program evaluation, technologies, and policy options that assist the Army to retain quality soldiers, improve soldier and unit readiness, and increase family adaptation to Army life. This report documents the development of operations

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definitions and measurement instruments to assess individual and unit readiness. The development process included a review of literature, soldier readiness workshops to identify the dimensions, and spouse workshops.

RN 91-33 Training With the M1 Conduct-of-Fire Trainer (COFT): Instructor/Operator (I/O) Perspectives, Graham, S.E. February 1991. (AD A233 614) The military and civilian I-COFT Instructor/Operators (I/O) in the Armor School's Weapons Department possess a wealth of valuable training information gleaned from years of Armor training experience. This information should be shared with other I/Os and Armor trainers. This research was conducted to aid COFT trainers in the field and the schoolhouse by identifying those I/O training techniques that are particularly effective for the training tank gunnery skills on the COFT. Structured interviews were conducted with the I/Os to discover how to best use the COFT to train tank gunnery skills. Given the increasing costs of live-fire training and the additional need to specify an optimal mix between simulation-based and field training, the interviews also asked the I/Os to discuss the specific value of live-fire training and its relationship to COFT training. The I/Os described a variety of techniques for training nearly all crew gunnery skills on the COFT. They identified a number of common training problems and offered tips and the techniques on how to train particular skills. Various approaches for training acquisition, tracking, and procedural skills on COFT are discussed, as well as more general COFT training issues, device-specific skills, and features and training enhancements to be found in the Advanced Matrix that is currently under development. The results also identify those aspects of live-fire training no trained adequately on COFT.

RN 91-34 Project A: Improving the Selection, Classification, and Utili-

zation of Army Enlisted Personnel: Annual Report, 1988 Fiscal Year, Campbell, J.P. February 1991. (AD A233 750) This report describes research during the 6th year (FY88) of Project A, the Army's long-term program to develop a complete personnel system for selecting and classifying entry-level enlisted personnel. During FY88

- the longitudinal validation (LV) predictor and end-of-training data collections were completed,
- the first-tour job performance measures from the concurrent validation (CV) were prepared for administration to the LV sample,
- the job analysis for second-tour performance was completed,
- second-tour hands-on measures and job knowledge tests, Army-wide, MOS-specific and combat prediction rating scales, situational judgement tests, and role-play exercises were developed, and
- the criterion data collection for the first-tour LV and second-tour CV samples was started.

RN 91-35 Task Analysis and Workload Prediction for the MH-47E Mission and a Comparison With CH-47D Workload Predictions Volume II: Appendices A-N, Bierbaum, C.R.; Hamilton, D.B. March 1991. (AD A235 249) For this research, a mission scenario was used to conduct a comprehensive task analysis for MH-47E operations. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission and identified 5 phases, 15 segments, 73 functions, and 239 tasks. The crew member performing each task was identified, and estimates of the sensory, cognitive, and psychomotor workload associated with the tasks were derived. Estimates of the task durations also were derived. The mission/task/workload analysis data were used to develop a computer model of workload for MH-47E crew members. The model used a bottom-

up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-47E pilot and copilot was compared to the CH-47D baseline workload prediction to determine the impact of the advanced technology on the MH-47E. The comparison indicated little difference in the predicted workload for the pilot and indicated a lower predicted workload for the copilot in the MH-47E. Volume I of the report describes the methodology and summarizes the results of the research. This volume contains the appendixes, which present the workload predictions of the Ch-47D model; the MH-47E mission/task/workload analysis, decision rules, and workload predictions; and a comparison of the predictions from both models.

RN 91-36 Taxonomic Transformations of Visual Media Selections Into Display Specifications, Gilson, R.D.; Myler, H.R. March 1991. (AD A235 596) This research examined relationships between characteristics of visual stimuli and learning as a first step in developing decision-support systems to help estimate visual fidelity requirements for device-based training. On the basis of reviews of psychophysical and other literature, the authors concluded that little is known about the relationships between characteristics of visual stimuli and learning. An experimental decision-support system was nevertheless developed, with critical "gaps" in essential data as noted in this report. Information in this report may be helpful in estimating visual display parameters. Examining the quality of the estimates will require validation research that, because of the time and cost

constraints in training-device development, is unlikely to be feasible.

RN 91-37 Armor Training in the Idaho National Guard, Drucker, E.H.

April 1991. (AD A235 595) The research described in this report represents a preliminary step in the development of a device-based, tank gunnery training strategy for use at the Company level by the Army National Guard. This report presents the results of an analysis of the tank gunnery training program implemented in the Idaho Army National Guard (IDARNG). Data for the analysis were obtained from (a) interviews with IDARNG officers and NCOs at Brigade, Battalion, and Company levels; (b) questionnaires administered to Company-level personnel; (c) Brigade- and Battalion-level training guidelines; and (d) Company-level training schedules. The results showed that Multiple Integrated Laser Engagement Systems (MILES), the Stout device, and Telfare are available for training. Although the Stout device and especially MILES were widely used for training, Telfare was not used. One Unit Conduct-of-Fire Trainer (U-COFT) is available at the major training area, but it is used by crews only during Annual Training and for short periods of time. A Mobile Conduct-of-Fire Trainer (M-COFT), however, soon will be assigned to the Battalion and will be available for use at each armory. Lack of security at local training areas prevents tanks from being stored at these sites, and lack of access to one site prevents tanks from being transported there. Planned security arrangements should alleviate the storage problem in the future. For environmental reasons, land damage is repaired after tank maneuvers are conducted. Environmental concerns may close access to some maneuver areas in the future. Adequate training areas are available, however, so the impact may be small. An insufficient number of tanks is available for training at armories and at local training areas, but a sufficient number is available

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at the major training area. The problem at local training areas will be alleviated when security arrangements are completed. Other training requirements and duties reduce the time available for gunnery training. However, the impact of these other requirements can be reduced by concurrent training. Implementation of some training guidelines contained in the U.S. Army Armor School's armor training strategy may not be feasible due to possible lack of funds for additional training assemblies. Also, the recommended amount of training on M-COFT may not be feasible because of scheduling problems and conflicts with other training requirements.

RN 91-38 Initial Validation of the Army Aviator Classification Process,

Intano, G.P.; Howse, W.R.; Lofaro, R.J. April 1991. (AD A235 768) Initial Entry Rotary Wing Multi-Track(IERW-MT) flight training was initiated by the U.S. Army Aviation Center (USAAVNC) in 1988. Under this program, flight students complete their training in one of four rotary wing aircraft types by the 85th day of flight school. The Army Research Institute Aviation Research and Development Activity (ARIARDA) developed a method to optimize aviator candidate classification for best probability of success. This method was implemented by the USAAVNC in May 1988. In this initial validation study, 686 IERW-MT graduates assigned to training tracks by the ARIARDA-developed procedures provided data to determine if the discriminant functions to be used would accurately match students with their assigned aircraft and to determine if the functions could be enhanced by including other available performance data. This effort also explored the potential of the classification test battery for predicting flight deficiency training setbacks, track flight performance, and common core training performance. The results strongly support the utility of the classification procedure for track assignment and

indicate its applicability to performance prediction.

RN 91-39 Predicting Performance

Breakdown in Pilots Through Objective Measures of Stress Sensitivity: Annual Report, McKenna, F.P.; Sharma, D. April 1991. (AD A238 597) While the adverse effects of stress are widely recognized, researchers have difficulty in developing appropriate measures. Previous research has rested heavily on subjective measures. The present approach is based on development of a simple objective performance-based measure. By showing that emotional stimuli disrupt performance, the basis of a test of stress resistance is formed. Major progress has been made by putting the test on a computer, where a more detailed investigation reveals that (1) the performance decrement due to emotional stimuli occurs early in the test, and (2) the time pressure results in large fatigue effects. Both these findings have implications for future developments of the test.

RN 91-40 Predicting Performance

Breakdown in Pilots Through Objective Measures of Stress Sensitivity: Final Report, McKenna, F.P.; Sharma, D. April 1991. (AD A237 540) It is well known that stress can have an adverse effect on performance and that individual differences in responses to stress are varied. This research explores the potential of developing an objective measure of stress resistance and the possibility of developing a laboratory model of the effects of stress on performance. The paradigm developed reveals that (1) emotional stimuli disrupt performance, (2) the disruption is exacerbated by time pressure and task difficulty, (3) repetition of the emotional stimuli (habituation) eliminates the disruptive effect, (4) it is not the emotionality of the stimulus, but rather the threat component that is critical to the disruptive effect. These results parallel effects in everyday life and suggest that the

paradigm shows great promise for developing a measure of stress resistance and a laboratory model of the effects of stress.

RN 91-41 Development and Application of a Military Intelligence Job Comparison and Analysis Tool, Seven, S.; Akman, A.; Muckler, F.A.; Knapp, B.G.; Burnstein, D. April 1991. (AD A237 804) As part of a military intelligence MOS-intelligence/electronic warfare (IEW) analysis method, the Job Comparison and Analysis Tool (JCAT) was developed to identify MOS capabilities and IEW system demands in terms of abilities, skills, and intelligence production activities. Its origins can be found in the Manual for the Ability Requirements Scales (MARS) developed by E. A. Fleishman and associates. JCAT embodies flow diagram decision methods and scalars from this earlier work; the methodology has been expanded to address intelligence production activities. The technique has been used in a test application at the U.S. Army Intelligence Center and School (USAICS) at Fort Huachuca to collect abilities and skills data for the seven MOS comprising the 96 Career Management Field (CMF).

RN 91-42 Requirements-Based Restructuring of Army Military Occupational Specialties, Haught, D.; Akman, A.; Finley, D.L. April 1991. (AD A236 675) In 1988, the U.S. Army Signal Center requested that the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) initiate a focused examination of Military Occupational Specialty (MOS) restructuring issues in the Army's Signal Branch. Phase one of this effort focused on operations-based MOS restructuring at the personnel component level. This first document of phase two will extend this effort into requirements-based restructuring that occurs as part of developing and fielding new doctrine, organizations or equipment systems. This research

note establishes the baseline for requirements-based MOS restructuring using new equipment specifications as the triggering mechanism for restructuring. The baseline is drawn in terms of existing policies, practices, and methods used by Army combat developers to determine MOS structure needs. This document provides the foundations for identification and development of methods to improve requirements-based MOS restructuring at the training center or service school level.

RN 91-43 Handbook for Conducting Analysis of the Manpower Personnel and Training for a MANPRINT Assessment, Guerrier, J.H.; Lowry, J.C.; Jones, R.E., Jr.; Guthrie, J.L.; Barber, J.L.; Miles, J.L., Jr. April 1991. (AD A235 430) This handbook is a guide to the analysis of manpower, personnel, and training (MPT) topics as a part of a MANPRINT assessment. Some of the theory underlying Manpower and Personnel Integration (MANPRINT) and the technical and administrative steps in the MPT analysis are presented. The sequence of activities for conducting the MPT analysis, the rationale underlying those activities, and specific approaches to planning the MPT analysis are included. Also addressed are the topics of interviewing personnel and collecting data as well as sources of data relevant to MPT aspects of system performance. A format for the MPT analysis report is provided. The handbook is illustrated with examples from the MPT analyses of three materiel acquisition programs.

RN 91-44 The Army Family Research Program: Origin, Purpose and Accomplishments, Bell, D.B.; Scarville, J.; Quigley, B. April 1991. (AD A238 729) The U.S. Army Research Institute for the Behavioral and Social Sciences Army Family Research Program (AFRP) has provided research support for our sponsor, the U.S. Army Community and Family Support Center

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(CFSC), and for the Army Chief of Staff's (CSA) Army Family Action Plans since 1986. This report explains the workings of the project and summarizes progress, to date, in meeting the research objective. That objective is to support the AFRP through research products that (1) determine the demographic characteristics of Army families, (2) identify ways to improve family adaptation to Army life, (3) increase the Army sense of community and partnership, (4) increase family support for retention, and (5) identify family factors that impact on individual and unit readiness. In addition, the report provides a complete list of completed products and products projected to be completed by the end of FY91. The report is based on a series of briefings given by Dr. Bell to future garrison commanders in training at the Army's Logistical Management College at Fort Lee, Virginia. At our Army sponsor's request, we are turning that material into a report so that the information can be used by the whole range of professionals—including commanders, policy makers, and online service providers—charged with taking care of Army families.

RN 91-45 High Bandwidth Diagnosis Within the Framework of a Microcomputer-Based Intelligent Tutoring System, Orey, M.A. April 1991. (AD A237 959) This paper describes a project undertaken with the U.S. Army Research Institute for the Behavioral and Social Sciences at Fort Gordon: The Advanced Learning for Mobile (ALM) Subscriber Equipment (MSE). This project resulted in the development of a system that operates in a 640K MS-DOS environment. The system has three major components: a hypermedia environment, a microworld, and a problem-solving environment. The focus of this paper is the intelligent tutoring system capabilities of the problem-solving environment. The problem-solving environment of ALM, which is MSE troubleshooting, has three emphases. The first

emphasis is high bandwidth diagnosis using a model tracing technique for modeling. The second is a conceptual framework for the organization of MSE within a problem-solving-supported interface. The third is the integration of frame-based and rule-based representations.

RN 91-46 Investigation Into the Manifestation of Hazardous Attitudes in U.S. Army Rotary Wing Crew Error Accidents With Individual Failure, FY 1984-FY 1989, Lineberry, G.T. April 1991. (AD B 156 195) Two hundred ninety-seven Class A, B, and C rotary wing accidents involving individual failure occurred in FYs 1984-89. This research analyzed a sample of 148 to determine the frequency of the inferred manifestation of six accepted hazardous attitudes (anti-authority, impulsivity, invulnerability, machismo, resignation, and get-home-it). Thirty-one of the accident could not be associated with hazardous attitudes and were excluded from further evaluation. Anti-authority was attributed to 23.4% of the remaining 117 accidents. (It was reasoned that this figure was inflated by lack of distinction between behaviors that were situationally and environmentally induced and true attitudes brought by the aviator to the accident scenario.) The weighted frequency of inference for the other hazardous attitudes was as follows: impulsivity, 17.2%; invulnerability, 14.7%; machismo, 6.7%; resignation, 14.5%; and get-home-it, 5.0%. A new taxonomy for categorizing hazardous attitudes based on the crew member's expectation of control and his/her subject of control was proposed. The taxonomy was tested on 15 cases with promising results. Researchers performed a series of statistical analyses on summary data for 134 aviators-in-error, relating flight experience and age to the commission of two common task errors and to the inferred hazardous attitude(s) of the aviator-in-error. No statistically significant correlations were found, but some broad inferences

were drawn. Evidence suggested some interrelationships among hazardous attitudes, but results were largely inconclusive. Finally, recommendations are made for future research emphases, for incorporation of hazardous attitude attribution into accident investigation methodology and aviator assessment programs, for heightened awareness of the need for background data of aviator age and experience, and for the use of pre-accident assessment tools as measures of aircrew coordination training effectiveness and as predictors of hazardous attitude manifestation.

RN 91-47 Canceled.

RN 91-48 An Evaluation of Tests of Sensitivity to Nonverbal Communication, Marshall, P.H. April 1991.

(AD B156 196) Ongoing research on the development of a test battery to improve screening and selection of students for intelligence interrogator training (97E) required evaluation of tests of sensitivity to nonverbal communication. The Interpersonal Perception Task (IPT) and the Affect Blend Test (ABT) were evaluated using a comparison between 97E students and instructors. Researchers concluded that the IPT offered a more realistic presentation, was less ambiguous in its scoring procedures, and appeared to be more valid. They recommend using the IPT in the test battery.

RN 91-49 Automating 76C-AIT Course Test Development and Analysis Procedures, Fritz, D.T. April 1991.

(AD A238 087) This report discusses the design of a software tool to aid researchers and instructors in development of a test plan matrix, construction of a test item bank, collection of student test results, analysis of student test data, and creation of class tests from the test item bank. It explains the initial program specifications, the refined specifications, the program pseudo-code, the data base design

and operators instructions, and includes full program documentation.

RN 91-50 Development of a Method for the Assessment of Manpower, Personnel, and Training Implications of Maintenance Requirements, Evans, D.C.; Roth, J.T. May 1991. (AD A237 929) The primary objectives of this project were to (1) identify the relationships among manpower, personnel, and training (MPT) factors considered during system acquisition as they impact maintenance performance; (2) organize the MPT factors; (3) determine quantitative relationships among the factors; (4) express the factors in terms of a common metric; and (5) develop a trade-off tool for examining the impact on maintenance of the identified factors based on the factor relationships. Eight models containing MPT factors that might impact maintenance performance were examined to determine the relationships among the models and their contained factors. Elemental factors from seven of the models were identified as representing metafactors found in the eighth model. Elemental factors representing a subset of the metafactors were selected for inclusion in a set of multiple regression analyses in which these factors predicted times to perform maintenance tasks. This resulted in weights for the elemental factors and the metafactors. A common metric for the weights was developed, and a trade-off tool was developed based on the performed analyses. Researchers found that the developed multiple regression equations accounted for a wide range of variance, depending on the dependent measure under examination.

RN 91-51 A Proposal for the Development and Application of an Automated Support System for Use in Army Rotary Wing Aircraft, Butler, D.P. May 1991. (AD B156 194) Research by the U.S. Army Research Institute for the Behavioral and Social Sciences on aircrew coordina-

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tion suggests that information management in the cockpit can be a primary source of crew error, especially during highly time-stressed missions. This project examined the application of information management technology to the cockpit to improve aircrew coordination and performance. In contrast with other research efforts seeking to automate pilot decisionmaking, this effort confines the use of automation technology to information management. Decisionmaking is still the responsibility of the crew members. This report outlines a proposed research project that would explore this issue in further detail.

RN 91-52 Promoting Individual and Organizational Productivity

Through Practical Intelligence: The Role of Tacit Knowledge in Personal and Organizational Effectiveness, Sternberg, R.J.; Wagner, R.K. May 1991. (AD A238 086)

This report on promoting individual and organizational productivity through practical intelligence discusses the authors' tacit-knowledge framework and some of the experiments done to test the framework. The basic idea behind the experiments is that a critical component to success in organizations is tacit knowledge, or what one learns on the job that is not explicitly taught and often, not even verbalized. We have done a series of experiments that show, in a variety of jobs and settings, the importance and nature of tacit knowledge. These experiments examined the role of tacit knowledge in jobs such as management, teaching, and sales, and looked at the importance of tacit knowledge to students. We found that tacit knowledge tends to increase with experience, although it is what one learns from experience rather than the experience itself that is critical. We also found that tacit knowledge is unrelated to traditional measures of intellectual abilities, and that it predicts job performance about twice as well as conventional ability tests. Tacit knowledge is important in a variety of occupations and can be measured in

ways that are both reliable and valid. The authors believe this research shows that tacit knowledge is critical to success in organizational settings.

RN 91-53 The Basic Map Interpretation and Terrain Analysis Course

(MITAC) Narrative, Miles, C.O. June 1991. (AD A238 753) The map interpretation and terrain analysis course (MITAC) was upgraded to a computer-based training format to correct deficiencies in low altitude navigation training for helicopter pilots. This report describes the narrative used to produce a set of videodiscs to store the course content for individual study. The narrative is divided into six sections that describe the interpretation of different kinds of topographic features (e.g., terrain relief, hydrography, vegetation, cultural features) that can be used for navigation.

RN 91-54 Distributed Problem Solving: Adaptive Networks With a Computer Intermediary Resource

White, S.; Lyman, J. June 1991. (AD A238 949)

This report presents an overview and instructions for administering a dynamic control skill task on the Macintosh. The acquisition of distributed dynamic control skills can be assessed through the programs that accompany the overview.

RN 91-55 Testing and Refining a Core Theory of Human Plausible Reasoning

Collins, A.; Burstein, M.; Baker, M. June 1991. (AD A242 693) This report details our extensions of a formal theory of human plausible reasoning. It presents an overview of the theory and experimental work.

RN 91-56 Natural Language Access to Intelligent Systems

Miller, G.A. June 1991. (AD A238 743) Work under this contract had two components, both aimed at facilitating natural language access to intelligent systems. One aspect examined ways of in-

creasing the vocabularies of personnel who use intelligent systems. The other was an attempt to increase the vocabulary that computer systems can process intelligently.

RN 91-57 A Workshop on the Gathering of Information for Problem

Formulation, Badre, A.N. June 1991. (AD A238 713) The purpose of this workshop was to assemble a group of research scientists from various disciplines to discuss and report their research findings on problem representation for interactive information processing. The proposed general topic was limited to the problems of representation and information processing in the context of human-computer interface. Based on this theme, a set of topics was developed and used to select and organize speakers and panels. Topics were

1. Psycholinguistic factors in computer communication
2. Compatible knowledge and memory structures for computer communication
3. Representing and structuring displayed information in computer communication
4. Representing information for decision, learning, and help processes in computer communication

The result was a successful workshop that included a total of 20 presentations and 40 participants.

RN 91-58 The Relationship of Simulator Fidelity to Task and Performance Variables

Alle, J.; Buffardi, L.; Hays, R. June 1991. (AD A238 941) This report describes a 3-year program of basic research to investigate the relationship between simulator fidelity and maintenance training effectiveness. A unique feature of this work was the use of a specially-designed reference system and simulator testbed for use in training simple electromechanical troubleshooting skills. Researchers report two experiments designed to compare the transfer performance of subjects in nine different simulator training

conditions. In both studies two aspects of simulator fidelity were manipulated—the degree to which a training simulator “looked like” actual equipment (physical fidelity), and the degree to which it “acted like” real equipment (functional fidelity). Results led to the following conclusions.

1. Simulator fidelity should not be considered a single, uniform concept, but a multidimensional one consisting of at least a physical and functional component.
 2. With “cognitive” tasks like troubleshooting, the functional similarity of training simulators to real equipment is a critical variable.
 3. Temporal variables such as time-to-solution, intertest time, and time-to-first attempted solution are particularly sensitive to fidelity manipulations.
 4. In simple troubleshooting tasks that emphasize cognitive skills, there may not be an advantage to “actual equipment” training.
 5. The difficulty level of criterion problems during transfer affects performance in a general way independent of simulator fidelity levels experienced during training.
 6. A number of individual difference variables seem to correlate well with the transfer of troubleshooting performance, e.g., GRE-A scores and tests of intellectual and social interests.
 7. Interactions between individual difference variables and training conditions suggest that the concept of adaptive training may be an applicable one in training situations like the one examined.
- Researchers discuss recommendations and suggestions for future research.

RN 91-59 User's Manual for CREATRDB (Revised)

Baldwin, J.D. June 1991. (AD A238 996) This document is a User's Guide intended for use by a database administrator responsible for creating mission databases using data collected at the National

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Training Center, Fort Irwin, CA. The software is suitable for use on a Digital Equipment Corporation VAX computer as configured at the Presidio of Monterey Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences. It is intended for use at the Presidio of Monterey Field Unit only.

RN 91-60 User's Manual for CREATJRTC, Baldwin, J.D.

June 1991. (AD A238 820) This document is a User's Guide intended for use by a database administrator responsible for creating mission databases using data collected at the Joint Readiness Training Center, Fort Chafee, AR. The software is suitable for use on a Digital Equipment Corporation VAX computer as configured at the Presidio of Monterey Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences. It is intended for use at the ARI Presidio of Monterey Field Unit only.

RN 91-61 An Integrated Cognitive Architecture for Autonomous Agents, Langley, P.; Thompson, K.; Iba, W.; Gennari, J.; Allen, J. June 1991. (AD A225 701)

This report describes ICARUS, a cognitive architecture designed to control the behavior of an integrated intelligence agent. The framework assumes that all long-term knowledge is organized in a probabilistic concept hierarchy, that heuristic classification is the central performance mechanism, and that a process of concept formation underlies all learning. The report describes the three components of ICARUS and relates them to other cognitive architectures.

RN 91-62 The Effects of Stress on Judgment and Decision Making: An Annotated Bibliography, Moss, E.F.; Hammond, K.R. June 1991. (AD A239 005)

This bibliography contains annotations for 48 articles. The articles fall into two main categories: empirical studies and theoretical and review

articles. Although the former outnumber the latter 35 to 13, the ratio of review articles to empirical articles is surprisingly large. The bibliography will help researchers to locate scientific articles on the effects of stress on judgment and decision making.

RN 91-63 Developing a General Contingency Planner, Phase II, Young, P. June 1991. (AD A238 728)

This report summarizes the work performed in the final phase of a 3-year effort to investigate basic mechanisms for solving planning problems in domains characterized by adversity. In the first phase of the effort, a general purpose planning mechanism was developed. This planner represented plans in a manner consistent with the goal tree formalism characteristic of Artificial Intelligence action planning research and used plan generation/search techniques derived from both AI action planning and knowledge-based game-playing theory. In the second phase of the effort, advanced planning mechanism was also extended from its initial domain (the two-player boardgame of Othello) to an Army maneuver planning domain.

RN 91-64 The Internal Model of Complex Dynamic Systems, Wickens, C.D. June 1991. (AD A238 722)

This report examines processing of multiple visual channels of information that pertain to complex dynamic systems. Three classes of results are described: (1) those that focus on the properties of the operator's mental representation or mental model of the system, (2) those that address the optimal means of displaying information about the system, and (3) those that focus on the cognitive biases observed when the mental model is updated by displayed information. Greatest emphasis is placed on the second of these classes, in which the principle of compatibility of proximity for object display integrality is developed.

RN 91-65 Final Report: Novice Strategies for Comprehending Technical Texts, Lucas, D.D.; Larkin, J.H. June 1991. (AD A239 731) This project investigated the comprehension of technical texts by novice readers (i.e., people not familiar with technical subject matter). It focused on two questions:

- How do novice readers determine what is important in technical texts?
- How does the organization of information in technical domains influence novice text-processing and learning?

Our research on how novices assess importance found that they develop rules that define what categories of information (i.e., definitions, facts, equations, etc.) are important in technical domains and judge importance in technical texts using these rules. These rules determine what novices pay attention to during reading, what they remember later, and their depth of understanding of the text. However, these rules are too general to allow novices to accurately assess important information in technical texts. Accordingly, these findings have practical implications for how technical texts should be written to correct for these importance rules and guide novices to the appropriate content. Our research on the organization of information in technical domains showed that the order of mention of information influences attention and learning. When information is presented early in a text, it is more thoroughly processed and more likely to be recalled. This is because (1) readers expect important content to be presented first, and (2) there is greater uncertainty about the role of that information in the context as a whole. However, readers find some types of organization more natural than others and will reorganize text according to these preferred organizations. Additionally, novices find it easier to process technical texts if they begin with general superordinate content

that can be used as an organizational framework for processing later text information. These results have implications for organization of technical content.

RN 91-66 User's Guide to the ARI-NTC Mission Databases (Revised for 90-01 forward databases), Baldwin, J.D. June 1991. (AD A238 640) This report demonstrates the use of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) mission databases for the National Training Center at Fort Irwin, CA. It has a general discussion of the types of data that are included in the databases, as well as general principles of variable naming. The text also contains a series of examples that use the INGRES query language to extract, categorize, and summarize data contained in the databases. It is intended as a learning guide for users of the database who wish to construct their own set of database queries associated with specific research requirements.

RN 91-67 User's Guide to the ARI-JRTC Mission Databases (Using JRTC I-Miles Data), Baldwin, J.D. June 1991. (AD A238 819) This report demonstrates the use of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) mission databases for the Joint Readiness Training Center at Fort Chaffee, AR. It contains a general discussion of the types of data included in the databases, as well as general principles of variable naming. The text also contains a series of examples that use the INGRES query language to extract, categorize, and summarize data contained in the databases. It is intended as a learning guide for users of the database who wish to construct their own set of database queries associated with specific research requirements.

RN 91-68 A Theory of Inference Derivation for Qualitative Data: Development and Test With Application to

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Criminal and Terrorist Detection, Canter, D.J.; Wilson, M. July 1991. (AD A241 471) For this research, the authors developed a process for modeling group decision making. The models are based on analysis of the options selected by members of the group working alone or with others in "committees." The selection process is represented as exclusive, exhaustive category schemes (facets) to describe the options available and then the choice of alternatives using these facets. The analysis of these generation and selection processes is modeled using nonmetric multidimensional scaling procedures. A series of studies shows that the facet analyses model effectively many aspects of group decision making when the choice criteria involved are essentially qualitative. The application of the facet framework therefore provides a theory of how groups make inference by combining the option selection of their individual members. Aspects such as dominance, alliance, opposition, and involvement, issue salience and relevance and can all be made operational within the facet models of a given group. Studies indicate that by feeding back to a group the results of this type of modeling "committee" effectiveness may be enhanced. The theory provided a basis for creating an online, interactive group decision support system. Applications of the modeling process to actual decision problems in relation to serial sexual assaults, hijacking, and research grant allocation, as well as student housing selection serve to illustrate the great range of problem solving groups that the theory and a system based on it can assist. The following are major findings from the studies:

- The system can model both the task and process of group decision making.
- The model can identify possible alliances and opponents in the decision making group.
- Measurement of group perceptions can be fed back to the decision makers, illustrating, for example, the perceived effectiveness

of leadership and the experts' satisfaction with the representation of their views.

- The model has proved particularly successful in deriving inferences in linking of serial crime and can represent actual links between crimes derived from the opinions of experts more accurately than the experts can themselves in their group decisions.
- The representational techniques can be applied to unstructured accounts of terrorist activity, demonstrating similarities and differences in behavior that can be associated with either "personal" or "political" skyjacks and with terrorists.

RN 91-69 Not assigned.

RN 91-70 The Use of Magnetoencephalography in Evaluating Human Performance, Flynn, E.; Aine, C.; Arthur, D.; George, J.; Oakley, M.; Hulsteyn, D.V. June 1991. (AD A238 742) During this reporting period, both hardware and software necessary to accurately measure the magnetic fields emitted from the brain during information processing were assembled and utilized. Experiments examine localized neural processing activity for auditory, visual, and somatosensory modalities.

RN 91-71 Assessment of Model Generative Reasoning for Use in the Intelligence Production Performance Model, Coombs, M.J.; Hartley, R.T.; Pfeiffer, H.D. June 1991. (AD A238 834) This report assesses the applicability of the enhanced-Model Generative Reasoning (e-MGR) problem-solving architecture for supplying the information processing mechanisms for the Intelligence Production Performance Model (IPPM). The independent variables controlling error performance in the IPPM have analogical relationships with the operators in the e-MGR. A software demonstration illustrates the integration of e-MGR and IPPM to produce context changes resulting from errors

in hypothesis generation. The e-MGR can provide a suitable set of mechanisms for augmenting the IPPM. The e-MGR mechanisms can dynamically sketch the etiology of errors and their decision efforts.

RN 91-72 Eliciting Knowledge From Military Experts: An Associative Network Approach, McDonald, J.E. June 1991. (AD A238 832) For this report, path-finder and hierarchical cluster analyses were used to analyze knowledge elicited from military intelligence experts. Researchers derived associative networks for both individual and average data sets. Judges also graded the different networks. Results indicated that the networks were a reasonable representation of the military intelligence domain examined. In addition, the judges preferred the average network over their own networks. The techniques may provide a means to describe individual mental models in order to study differences in performance attributed to individual differences.

RN 91-73 Variations in Weapons Instruction: A Case Study of Dragon Gunnery, Lucariello, G.; Dyer, J.L.; Heller, F.H. June 1991. (AD A238 833) For this report, the training resources and instructional methods used to train Dragon (an antiarmor weapon) gunners at four different locations were documented and compared for consistency and to Army guidelines. Army and Marine Corps institutional training, and Army mechanized and nonmechanized unit training were formally observed. Training tanks, instructional and testing procedures, and times differed across sites, indicating that standardization of instruction is difficult to achieve. Results were used as the basis for a training impact analysis of the advanced antitank weapon system-medium (AAWS-M), the replacement system for Dragon.

RN 91-74 Dragon Gunner Selection and Training Elimination Criteria,

Morey, J.C.; Holmgren, J.E.; Evans, K.L.

June 1991. (AD B157 136) This report documents an assessment of the feasibility of pre-selecting gunners for M47 Dragon antiarmor system training or eliminating them during the course of training or both. Analyses were conducted on data obtained from the Cost and Training Effectiveness Analysis (CTEA) conducted in 1978 by the U.S. Army Combat Developments Experimentation Command (USACDEC) and as part of the Launch Effects Simulator (LES) Force Development and Evaluation conducted by the U.S. Army Infantry Board in 1979. On the basis of task analyses and operational performance requirements of the Dragon, approximately 70 biographical, anthropometric, psychomotor, aptitudinal, and vision measurements were obtained on two samples of Dragon gunners. Three additional measures of proficiency on the primary training device, the Launch Effects Trainer (LET), were gathered while gunners were undergoing training. Multivariate statistical techniques were used to identify those measurements (i.e., gunner characteristics) most related to live missile firing performance that could be used to preselect gunners for training, to eliminate gunners from training, or both. The most reliable criterion of live missile performance was combined first and second missile hit or miss. From the initial sample of unit soldiers, visual acuity, hand width, and Skilled Technical Score (ST) from the Armed Services Vocational Aptitude Battery (ASVAB) emerged as gunner selection characteristics that correctly classified 87% of the best and poorest gunners. The number of qualification tables to achieve an 80% hit rate on the LET was shown to be strongly related to live missile performance and useful for gunner elimination. A second, independent sample of gunner trainees failed to substantiate the findings from the first sample. The three selection characteristics correctly classified

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only 52% of the cross-validation sample. Attempts to develop a new selection model that cross-validated on the initial sample and to develop a selection model based on the combined data set were unsuccessful. In addition, differentiation of the best and poorest gunners on the basis of LET performance was not demonstrated in the second sample of gunners. In conclusion, neither body size, visual acuity, past experience, nor aptitude measured by AS-VAB scores bore any appreciable relationship to ability to fire the Dragon missile. A gunner selection model, therefore, is not a promising solution for improving Dragon gunner performance. Further, none of the performance measures obtainable from the LET during training was shown to be consistently related to subsequent live missile firing performance.

RN 91-75 Distributed Problem Solving: Adaptive Networks With a Computer Intermediary Resource, Lyman, J.; Brooks, M.B.; Wong, C.K. June 1991. (AD A238 721) Networking of information sources in relation to an organizing center is often a requirement for finding solutions to problems that individuals cannot solve alone. The process may require ongoing situation assessment by the problem-solving participants and the sharing of assessment progress via transfer of information over physically restricted communication links. The communication process may occur under conditions in which the participants are stressed. In the experiment reported in this Research Note, three, physically separated Macintosh computer workstations were placed in mutual communication under various restrictions and monitored by a fourth computer that served as a file server and central data collection resource. The problem was presented as animated tanks moving across a master battlefield terrain map with different, overlapping, limited portions of the map shown on the screen at each workstation. With various restrictions placed on the com-

munications channels, subjects sent and received messages and tried to arrive at conclusions regarding tank action parameters. Twenty-four college students participated as subjects. A 10% and a 50% probability of detection of the observer by the "enemy" produced a threat situation and certain operational consequences if detection occurred. The objective was to arrive at an estimate of enemy strength, destination, tactical objective, and observer location. The results suggest that a broadly accessible communications system produces higher quality situation assessment results but has certain constraints and caveats.

RN 91-76 Quick Development Microcomputer System: Training Automatic Components for Electronic Troubleshooting, Schneider, W. June 1991.

(AD A239 573) This report investigates how practice aids development of diagnostic troubleshooting skill and how to speed the skill acquisition process using desktop simulation techniques. Experiments show how practice can build up automatic component skills so they can be executed quickly, reliably, with little effort, and be incorporated into more complex skills. The researchers developed objective criteria that can be used in microcomputer software to specify when to promote a student from practicing a component skill to practicing the aggregate skill level.

RN 91-77 Canceled.

RN 91-78 Examining the Effect of Information Order on Expert Judgment, Adelman, L.; Tolcott, M.A.; Bresnick, T.A. June 1991. (AD A239 708)

For this report, researchers performed an experiment in which trained Army air defense personnel created a paper-and-pencil representation of their task to test the predictions of the Einhorn-Hogarth model for belief updating. For a

simple task with a short series of information, the model predicted a significant information order by response mode interaction. The experiment supported the model's predictions. When information was presented sequentially and a probability estimate was obtained after each piece of information, the order in which the same information was presented significantly affected the final mean probability estimates. In contrast, when all the information was presented at once and a probability estimate was obtained at that time, information order had no effect. There were, however, significant individual differences. Moreover, order and response mode cumulatively accounted for less than 10 percent of the total variation in the participants' probability estimates. These findings, and their implications, are discussed in the report.

RN 91-79 Developing a General Contingency Planner for Adversarial Planning, Lehner, P.; McIntyre, J. June 1991. (AD A239 487) This report summarizes the first year of a 3-year effort to investigate the basic mechanisms for solving planning problems in environments that contain intelligent adversaries. A general purpose planner that can solve adversarial planning problems in a variety of domains is presently under development. This planner, called CP/x (Contingency planner version x), uses a formalism for representing the plans, which are consistent with the goal tree formalisms found in action planning in Artificial Intelligence (AI), while using plan generation/search techniques derived from both AI action planning and "knowledge-based" game playing theory. CP/1.0, the first version of this planner, is described in this report, and approaches to incorporating advancing planning techniques (e.g., metaplanning, hierarchical, and distributed planning) are discussed.

RN 91-80 Interim Report: Distributing Problem Solving: Adaptive Net-

works With a Computer Intermediary Resource: Intelligent Executive Computer Communication, Lyman, J.; Conaway, C.J. June 1991. (AD A242 797) This report presents a system concept for an "intelligent executive." Specifically, the functional requirements of a distributed group of agents are analyzed, along with the characteristics of different forms of communication. The intelligent executive embodies guidelines for specifying an appropriate communication strategy given the problem environment and the informational requirements of the group. When employed within a distributed problem-solving environment, the intelligent executive is expected to facilitate the solution to a problem by increasing communication efficiency and problem-solving capabilities of distributed agents.

RN 91-81 Optimizing the Long-Term Retention of Skills: Structural and Analytic Approaches to Skill Maintenance III, Healy, A.F.; Ericsson, K.A.; Bourne, L.E., Jr. June 1991. (AD A239 574) This research program identifies the characteristics of knowledge and skill most resistant to decay because of disuse. The program is divided into analytic and structural approaches. Two lines of research are used to investigate skill retention and maintenance using the analytic approach. The first investigates different laboratory analogues of component military skills, and the second investigates parallel natural skills learned by the college population during prior education. We have developed five laboratory methodologies and completed experimental studies involving each of them, and have identified four natural skills and gathered long-term retention data for each of these skills. For the structural approach, we designed an experimental paradigm to assess the detailed encoding of new knowledge at presentation and at delay using verbal report techniques and chronometric measurement of retrieval components. We

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completed several studies of retention of vocabulary items with this paradigm. In addition, we formulated a theoretical framework, on the notion of procedural reinstatement, and have used this framework to account for findings from many different facets of our research program, both analytic and structural.

RN 91-82 Effects of Stress on Judgment and Decision Making in Dynamic Tasks, Hammond, K.R.; Lusk, C.

June 1991. (AD A239 452) Three empirical studies on judgment and decision making in dynamic tasks were carried out during the period 1 September 1988 to 31 December 1989. Subjects were expert research meteorologists. Topics were forecasting (a) hail, (b) microbursts, and (c) convection initiation (thunderstorms) at an airport approach. Primary findings were as follows:

- in the hail study, meteorologists' forecasts were closely approximated by a weighted-sum model;
- in the microburst study, experts who worked together for years, when tested in work conditions, did not agree on the judgments of principal cues;
- in the convection study, more accurate forecasts were made on high stress than low stress days, thus contradicting the conventional wisdom.

Two annotated bibliographies were produced: the effects of stress on judgment and decision making, and the effects of variation of display formats on judgment and decision making.

RN 91-83 The Effects of Selective Reenlistment Bonuses, Part I: Background and Theoretical Issues, Tinney, R. June 1991. (AD A238 754)

In order to manage its Selective Reenlistment Bonus (SRB) program effectively, the U.S. Army needs reliable information about the effects of SRBs on reenlistment rates at the Military Occupational Specialty (MOS) level. Until recently, research had not addressed important

methodological and empirical issues concerning structural economic modeling of the reenlistment decision, bias due to population heterogeneity, and interaction between compensation policy and retention. This research examines these fundamental issues and suggests techniques for their application at the MOS level. It highlights the importance of (1) understanding institutional details of compensation policy, including the role of SRBs; (2) defining random error terms in the empirical analyses; and (3) using longitudinal research data.

RN 91-84 A Training Strategy for Operational Field Test Data Collectors, Silver, J.D.

June 1991. (AD A239 575) This research note describes a training strategy designed for operational field tests of MANPRINT video reducers. It was developed for and implemented during the Line-of-Sight-Forward-Heavy Force Development Test and Experimentation (Phase II). The training consists of three phases: (1) system overview, (2) data collection process overview training, and (3) job-specific training. The strategy is designed to provide a systematic approach to the training challenges presented by use of video tapes for training.

RN 91-85 A Review of New Training Technology at the U.S. Army Signal School, Johnson, W.B.; Sanders, M.G.

June 1991. (AD A239 604) The Signal School and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Fort Gordon Field Unit surveyed and assessed training technology both within and outside of the Signal School. Interviews with managers and instructional staff at the school were followed by training technology questionnaires completed by representatives of all of the school's training departments. The results showed that the majority of the Signal School's new training technology is delivered with interactive videodisc. Full scope simula-

tors, procedural trainers, and computer controlled basic electricity/electronics test benches are also used. New training technology alternatives, not currently at the Signal School, were reviewed by ARI and a contractor team. The majority of systems reviewed used artificial intelligence techniques to deliver intelligent tutoring systems (ITS). Most of the ITS identified were in a transitional stage of development. Reviewers gave particular attention to systems likely to be compatible with Electronic Information Delivery System (EIDS), which is readily available in the Army training environment. During the final stage of research, ARI conducted a training technology workshop for Signal School management. The workshop reported the current status of and plans for future development and use of new technology training at the Signal School.

RN 91-86 Final Report: Psychological Analyses of Courageous Performance in Military Personnel, Rachman, S.J. July 1991. (AD A241 226) This research examined the nature of courageous performance and ways in which it can be promoted. The practical objective was to develop methods for predicting courageous performance. Military personnel who perform hazardous duties were studied before and after training, during operational duties, and under laboratory stress. Various measures were used to assess their behavior, subjective reactions, and psychophysiological responses. The bulk of the research was carried out on military bomb-disposal operators. Supplementary studies were carried out on veterans of the Falklands war and on soldiers undergoing parachute training. The studies confirm the significant and positive psychological effects of the training procedures, the cumulative effects of operational duty on levels of confidence and skill, the psychological differences between experienced and inexperienced operators, the psychological problems that arise during operations, and the aftereffects of a

tour of active duty. In addition, we determined that most bomb-disposal operators performed fearlessly on virtually all missions, and that during the 4-month tour of duty their mood states were stable. A psychometric analysis of a group of operators who received decorations for gallantry revealed some differences in personality between these soldiers and another highly competent group of operators. The probability that there is a small group of soldiers who are especially capable of carrying out dangerous tasks fearlessly was strengthened by a psychophysiological study of reactions to stress. We found some (physiological) differences between decorated operators and non-decorated operators, who were in turn less reactive to stress than civilian control subjects. Confirmation of these results supports development of methods for identifying these people in advance, and perhaps choosing them for assignment to particularly hazardous tasks. A prospective study of 28 bomb-disposal operators was also completed, and using a discriminant function analysis, it was possible correctly to classify all of the decorated operators. An investigation of the hypothesis that a positive attributional style promotes courageous behavior was conducted on two groups of soldiers but the hypothesis was not supported.

RN 91-87 New Directions for Educational Psychologists, Tobias, S. July 1991. (AD A239 743) This paper examines demographic trends and projections of futurists to suggest new roles for educational psychologists. Among these are functions dealing with maintenance of health, educating older people, instructing personnel to care for chronically ill populations and in administrative and training roles in the expanding day care field, and opportunities in the preparation of instructional materials, including computer-assisted instruction.

RN 91-88 Test Anxiety and Post Processing Interference II, Tobias, S.

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July 1991. (AD A239 819) This experiment was performed to determine whether test anxiety interferes in the retrieval of prior learnings from long-term memory and to investigate the degree to which anxiety affected post processing interference. Thirty students were administered Sarason's Text Anxiety Scale and four subtests of Weinstein's Learning and Study Skills Inventory (LASSI). Students were asked to memorize two 18-word lists, each consisting of three different categories, to a criterion of one perfect recall. Students were randomly assigned to one of three conditions: (1) acquisition stress ego involving instruction administered prior to the beginning of the task, (2) ego involving instructions after acquisition, or (3) no ego involving instruction of any kind. It is conceivable that study skills, like text anxiety, affect performance mainly in the presence of effective stress.

RN 91-89 Organizational Assessment to Support the USAREC On-the-Job Recruiter Training Program, Love, K.G.; Jex, S.M.; Richard, R.L.; McMullin, C. August 1991. (AD A159 360) This report describes an organizational assessment of the U.S. Army Recruiting Command. The assessment was completed to determine the effectiveness of training program implementation and dissemination. Analyses evaluated the organization structure, communication, patterns, chain of command (hierarchy), and perception of staff members. Through representative interviews and survey research, a set of recommendations was developed. The recommendations will assist in improving training program impact throughout USAREC, yielding a potential for recruiter productivity increases.

RN 91-90 Fatigue Effects on Human Performance in Combat: A Literature Review, Evans, S.M.; Mackie, R.R.; Wylie, C.D. August 1991. (AD A242 887) For this report, a literature review was con-

ducted to assess the knowledge of the effects of fatigue and related stressors on the performance of military personnel engaged in diverse military tasks. The objective was to determine whether there are sufficient objective, quantifiable data on the effects and time-course of fatigue to justify incorporation into combat models. Both mental and physical fatigue were considered. More than 500 articles, reports, and books were reviewed for this effort. A summary table of the results of sleep deprivation studies was organized. Prediction equations for physical activity are discussed.

RN 91-91 Technical Aid for the Disposition of Remains, Palmer, D.R.; Brady, E.J. September 1991. (AD B159 564) This research product provides a technical and training guide for callers and receivers to use in the disposition of remains. Guides for dialogue are presented along with a checklist of important points to cover in order to complete the disposition process.

RN 91-92 Report Potential Applications of Voice Technology to Armor Training, Ingram, A.L. September 1991. (AD A242 462) This report presents potential applications of current low-risk voice technology to military instruction. Three programs of instruction were analyzed to select specified training tasks that might benefit from the use of this technology. In general, two classes of tasks were identified as potential candidates. The first class consists of those tasks that have a high oral content and are good candidates for computer-based instruction and interactive video instruction. The second class consists of tasks requiring trainees to interact directly with non-computer materials. Using voice technology would allow trainees to interact with computer systems and still have hands and visual attention free to manipulate the materials.

RN 92-01 Causal Schema Decision Aiding System, Hopple, G. October 1991. (AD A242 931) This report looks at the use of causal schema to organize concepts for understanding complex decision processes. The task selected for developing a prototype causal schema decision-aiding system was to implement portions of a fire support annex for a Corps operations order. A series of storyboards was developed based on an analysis of the prescribed elements of the Annex; the storyboards were evaluated as a prototype "decision aid." The author concludes that causal schema is useful in describing tactical decision processes and may offer advantages over rule-based approaches (e.g., artificial intelligence) in developing decision aids.

RN 92-02 Color Display System User's Guide, White, W. October 1991. (AD A242 911) This document contains instructions for executing a color display simulation on the Patriot Tactical Operations Simulator (PTOS). Materials include information needed for collecting data for operator performance measures and information about the procedure for changing display colors and switch/indicator locations. Some familiarity with the PTOS and the MPX operating system is assumed.

RN 92-03 Measures for Research on Small Unit Preparedness for Combat Effectiveness, Tremble, T.R., Jr.; Alderks, C.E. October 1991. (AD A242 717) For this report, the authors developed scales for research on the home-station factors that account for the preparedness of U.S. Army small units for combat. One set of scales, which was derived from questionnaire items, measured home-station factors in the areas of leadership, unit cohesion, and soldier motivation. The other set measured platoon mission performance during simulated combat at a U.S. Army Combat Training Center. This report describes the scales, their development,

and results on their statistical properties as a basis for analyses and reports on relationships between home-station factors and performance effectiveness.

RN 92-04 Causal Models in the Acquisition and Instruction of Program Skills, Reiser, B. October 1991. (AD A242 899) This report summarizes progress made on the Graphical Instruction in LISP (GIL) intelligent tutoring system and the Graphical LISP Exploratory Environment (GLEE) discovery system for instructing programming skills. We describe the status of these computer systems and the experiments investigating the role of explanations in learning, in addition to the use of graphical representations in problem solving. We also describe the BATBook problem-solving environment for the study of analogies in programming, as well as our studies of effective human tutors.

RN 92-05 Individual Difference Effects in Human-Computer Interaction, Ambardar, A.K. October 1991. (AD A243 172) The optimum design for human-computer interfaces has become an increasingly important concern. Optimization requires interface to match the characteristics of the user with those of the computer system. At present, it is not clear what user characteristics, beyond a limited set related to experience and training, should be considered. This research project addresses this question. Many forms of human-computer interaction can be viewed as problem-solving activities. Therefore, the cognitive characteristics that affect problem-solving performance may also affect problem-solving performance in the context of user interaction with a computer system. The questions addressed in this research were (1) How might fundamental, inherent individual difference dimensions of cognitive operations influence interface design?, (2) What cognitive dimension, beyond

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experience, is really important to human-computer interaction?, and (3) Aside from the classification of users into "expert" and "novice" categories, is a given interface design equally good in supporting the problem-solving activity of any particular person? Two experiments were conducted. The results revealed that efficiency in using computer systems depends on user cognitive characteristics and design features of computer interface. Further, usage of interface design features significantly interacts with a subject's fundamental cognitive characteristics/cognitivestyle.

RN 92-06 Predicting Performance in Army Aviation Primary Flight Training, Intano, G.P.; Howse, W.R. November 1991. (AD A243 594) The Army Research Institute Aviation Research and Development Activity (ARIARDA) successfully implemented the Multi-Track Test Battery and associated classification functions in 1988. The battery and functions have been used to assign more than 4,000 flight students to their combat skills aircraft. The subsequent program determined the applicability of the battery to prediction of student performance in flight training. This report examines prediction of performance in the first 100 days of training. Performance evaluation in primary training consists of four flight-phase grades and 12 academic-phase grades. In addition to these, primary overall average grade and primary overall flight grade were predicted using forward stepwise multiple-regression procedures. Stepwise multiple-discriminant analysis was used to investigate two additional measures—flight deficiency training setback and flight deficiency attrition. The capability of the battery to predict primary training grades is demonstrated. Results of discriminant analysis of setbacks and attrition should be viewed with caution.

RN 92-07 Evaluation of the Reserve Component Armor Junior Leader Tactical Training Program, Jones, D.R.;

Bullock, C.M.; Henriksen, D.; Tkacz, S. November 1991. (AD A243 592) This report presents the results of a user-based evaluation of a prototype Electronic Information Delivery System (EIDS)-based simulation called the Reserve Component (RC) Armor Junior Leader Tactical Training Program. The simulation was developed to support individualized tactical training of RC armor platoon leaders and sergeants. The evaluation was conducted to (a) determine how well target users can perform the tactical skills required by the program, (b) examine the program's level of user acceptance, and (c) identify program areas in need of improvement. The program was found to be challenging in that soldier performance was in most cases below the established proficiency standards. Performance did vary considerably, however, with better scores found for fundamental tactical skills typically trained in the unit. Results suggest that, after minor modification, the present EIDS-based program will help RC platoon leaders/sergeants improve their individual tactical skills and achieve maximum payoff from the limited training time available.

RN 92-08 The Development of a Rapid Train-Up Package and Tank Platoon Scenarios for Armor Training in the Army National Guard, Drucker, E.H. November 1991. (AD A243 593) This report describes the development of a rapid train-up package and tank platoon scenarios for armor training in the Army National Guard. The rapid train-up package, which consists of training materials designed for "opportunity" training and for home study, is intended for use at home stations during inactive duty training, at training sites during annual training, and at mobilization and postmobilization sites during mobilization. The package contains 17 training modules (52 different tasks) for tasks that must be performed from memory; five study guides (18 different tasks or knowledge areas) for acquiring knowledge

without access to equipment; and 30 graphic training aids for training and assisting with job performance. The package also contains directions for use and across-walk linking armor tasks to the appropriate training method. Further, the report describes the development of a set of scenarios for training platoon tactics on a mobile version of the Simulation Networking training device (M-SIMNET).

RN 92-09 A Review of Hardware and Software Technology Included within the Electronic Information Delivery System, Yates, J.R. November 1991.

(AD A243 826) For this report, the Electronic Information Delivery System (EIDS) hardware and its associated software, Authoring Software Systems of Interactive Simulation and Training (ASSIST), were examined. The purpose of the examination was to produce EIDS supplementary documentation with the associated EIDS storybook records. EIDS, with its integral videodisc player and branching capacity, is a medium capable of presenting learning tasks that span the continuum—from concrete to abstract. However, the EIDS ASSIST does not provide complete examples or program demonstrations. Without additional assistance, the user's initial experience with EIDS is cumbersome at best. Current documentation needs complete examples (paper and program) that include the full complement of media and programming functions available. The examples should demonstrate the production of tests that include fill-in-the-blank and multiple-choice questions and questions with several correct responses. A thoroughly tested example with feedback will provide the user with an experience of the interactive capabilities of EIDS. The two products in appendixes A and B provide a systematic exploration of the EIDS technology and will serve as an introduction to EIDS ASSIST programming language.

RN 92-10 The Job Requirements System: A Procedure for the Analysis of Occupational Requirements within Job Sets, Rossmeissl, P.; Schendel, J.; Jordano, J. December 1991. (AD A246 035) For this report, a procedure was developed for defining clusters or sets of jobs based on their human ability requirements. The procedure combines several human performance taxonomies into a flow-chart format, with the results defining the human abilities required for each type of performance. The procedure was tested by using it to establish job sets for a number of Army MOS.

RN 92-11 Final Report on Extending the Synthetic Validation Methodology to Assess Occupational Similarities Within Job Sets and to Select Classification Tests, Whetzel, D.; Rosse, R.; Peterson, N. December 1991. (AD A244 955) The primary objective of this project was to extend and evaluate the synthetic validation methodology for developing job sets and identifying appropriate tests for classifying individuals into job sets and/or within a set. This effort supports the research and development work for the Job Sets for Efficiency in Recruiting and Training (JSERT) concept. The objective of the project was accomplished in two ways: (1) by using a paper-and-pencil job analysis questionnaire and developing a PC-based technology to group similar jobs or to quantify the similarity/dissimilarity of already grouped jobs, and (2) by modifying existing synthetic validation methods to identify the most reasonable test or tests for classification/placement decisions.

RN 92-12 Who Uses the Cost-Benefit Rules of Choice? Implications for the Normative Status of Economic Theory, Larrick, R.; Nisbett, R.E.; Morgan, J.N. December 1991. (AD A246 309) Three factors predict whether people use the cost-benefit rules of microeconomic theory in their

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everyday decisions. These are effectiveness in achieving desirable life outcomes, intelligence, and training in economics. The authors argue that these empirical findings support the claim that cost-benefit reasoning is normative.

RN 92-13 Canceled. See RN 92-21.

RN 92-14 Building Human Variables into Combat Models, Cherry, W.P.; Davis, R.; Brecht-Clark, J. January 1992. (AD A247 002) This report presents a conceptual framework designed to represent human factors in combat models. The framework is organized to focus on small teams of "executing elements," the baseline performance of those teams in delivering their increment of combat power, and changes in performance associated with stress-recovery processes. The framework served as a starting point for research carried out at the National Training Center that investigated the impact of fatigue on combat performance. With respect to this goal, the results were largely inconclusive. However, the results did support a series of hypotheses that focused on the performance of command control executing elements and the high dependency between this performance and combat outcomes.

RN 92-15 Instructional Needs Analysis for Developing Special Forces Professional Expertise in Area Studies, Ellison, J.N. February 1992. (AD B162 671) This report assesses regional studies training offered to Special Operations Forces officers by the U.S. Army John F. Kennedy Special Warfare Center and School (JKFSWCS), Fort Bragg, NC. Specific recommendations for streamlining and enhancing professional career development training for FA39 PSOP/CA and Army Special Forces officers are presented with emphasis on the following: Assessment of the 1989 Program, Enhanced Professional Development Model, Integrated Programmatic Structure, Cooper-

tive Degree Program, and Capstone Course Development. Implementation strategies and supporting rationales are described in detail. These initiatives are linked to the broader national security context.

RN 92-16 Evaluation to Redesign a Prototype Officer Data Base for Interdisciplinary Research, Younkman, D.D.; Ramsey, L.G.; Guthrie, T.J. February 1992. (AD A247 919) This report describes a systematic research and evaluation of the quality of the existing Officer Longitudinal Research Data Base (OLRDB). The OLRDB consists of the core data set, Reserve Officer Training Corps (ROTC) advanced camp data set, ROTC commission data set, Automated Instructional Management System (AIMS) data set, and United States Military Academy (USMA) data set. The results of the evaluation suggest a redesign of the OLRDB to accommodate cohort longitudinal research designs and econometric research models. Further expansion of the OLRDB into the Longitudinal Officer Administrative Data Base (LOADB) would accommodate current and future research needs. The information in this report will guide efforts to expand the data base to accommodate behavioral, social, policy, and economic research.

RN 92-17 Officer Longitudinal Research Data Base: User's Manual, Younkman, D.D.; Ramsey, L.G.; Guthrie, T.J. February 1992. (AD A247 897) This report describes the data elements and data sets in the Officer Longitudinal Research Data Base (OLRDB). The OLRDB consists of the core data set, Reserve Officer Training Corps (ROTC) advanced camp data set, ROTC commission data set, Automated Instructional Management System (AIMS) data set, and the United States Military Academy (USMA) data set. The documentation provided in this report will increase accessibility of the OLRDB for research, studies, and analysis. In addition, job control lan-

guage (JCL) is provided to access these data bases using the Statistical Analysis System (SAS).

RN 92-18 Behavioral Variability Learning Processes and Creativity

Final Report, Richelle, M.N.; Boulanger, B.; Ingebos, A.M.; Lahuk, L. March 1992.

(AD A248 894) This research investigates properties of human behavioral variability. The concept of behavioral variability is discussed in the theoretical framework of learning theory, developmental psychology, and the psychology of intelligence and creativity. Relevant aspects of scientific literature are reviewed. Experiments investigate the effects of environmental factors on the variability of sequences of responses as a function of age, of cognitive capacities, and of educational background (for the adult subjects). Researchers used an experimental device that allowed for a number of equally efficient behaviors. Strategies used by subjects were recorded in various situations with differing degrees of constraint on freedom. Findings indicate that the performance, the variability, and the capacity to adapt to environmental contingencies are limited by the subjects' developmental level but they are not directly tied to cognitive capacities or cognitive styles. The mastery of the task seems to be slightly related to the educational background. The results suggest that variability is an inherent dimension of behavior, sensitive to its consequences, and that the potential for variation depends on the mastery of a set of basic behavioral units. The results support the idea that variability can be approached within the frame of learning theory and that, as a basic aspect of problem solving and creativity, it can be influenced by teaching.

RN 92-19 Anticipated Effects of Restructuring on Army Career Decisions: An Analysis of Comments from the 1990 Army Career Satisfaction Survey, Connelly, D.W.; Phillips, D. March 1992.

(AD A249 031) This report presents a content analysis of the 1990 Army career Satisfaction Survey, which was sent to 28,071 Army personnel. Nearly 60% of the enlisted, warrant, and commissioned officers in the sample responded to the survey, with over 30% writing comments to an open-ended final question. All comments were submitted on magnetic tape to the U.S. Army Research Institute for the behavioral and Social Sciences. The printed comments are included in a 575-page appendix to this report. The report highlights representative examples of the comments from all categories of respondents. Major themes of the comments are categorized as (1) job security, force reduction, and transition; (2) career opportunities and promotions; (3) quality of life issues (benefits, pay, medical care, etc.); (4) job satisfaction; and (5) need to retain quality personnel.

RN 92-20 Causal Models in the Acquisition and Instruction of Programming Skills, Final Report, Reiser, B. March 1992. (AD A248 761)

This research project investigates how an interactive learning environment supports students' learning and acquisition of mental models when acquiring a target cognitive skill. For this project, we constructed GIL, an intelligent tutoring system for LISP programming. We used GIL to conduct pedagogical experiments on skill acquisition. Two ways in which an interactive learning environment will facilitate acquisition of novel complex domains were studied. The first set of studies examines how graphical representations provide a representation more congruent with students' reasoning. The second set examines how explanatory feedback, generated from the system's problem-solving knowledge, facilitates students' learning. The experiments demonstrate that computer-based support helps students construct effective models for reasoning in complex domains.

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RN 92-21 Knowledge Acquisition for Application: Cognitive Flexibility and Transfer of Training in Ill-Structured Domains, Spiro, R.J.; Feltovich, P.J.; Coulson, R.L.; Jacobson, M.; Durgunoglu, A.; Ravlin, S. April 1992. (AD A250 147) This report presents research findings concerned with advanced knowledge acquisition of difficult material in ill-structured domains. The program had three interdependent aspects: (1) patterns of learning failure in advanced treatments of complex material and their causes and consequences, (2) new theory-based remedies for the observed patterns of learning failure, and (3) hypertext instructional approaches for forstalling learning failure and developing cognitive flexibility based on findings from the first two parts of the program. In the first part of the report, research is presented that reveals a substantial incidence of learning failure that is the result of oversimplification. In the second part of the report, we describe a theoretical orientation for more successful advanced knowledge acquisition in ill-structured domains—Cognitive Flexibility Theory (CFT). The third part of the report introduces a computer hypertext approach that has been systematically developed based on the instructional implications of CFT. Finally the CFH approach is illustrated in detail in a very complex and ill-structured domain, a hypertext for case-based learning of the structure of conceptual knowledge and its application in the military strategy of the “indirect approach.”

RN 92-22 Theory and Test of Stress Resistance, McKenna, F.P.; Sharma, D. April 1992. (AD A250 741) In this report, we developed a laboratory model to test hypotheses concerning the disruptive effects of emotional stimuli. The research assesses the potential of the computerized emotional Stroop task. We discovered that the task was sensitive to two important elements of stress resistance, threat and habituation. The

Stroop task is sensitive to the nature of the stimuli, namely that threatening stimuli can be distinguished from nonthreatening stimuli and that with stimulus repetition the stimuli show effects of habituation. Important findings emerged from the research in the following areas: (1) time pressure and task difficulty, (2) emotional lingering, and (3) use of a lie detector. The results of our research show that the paradigm that we developed can be used to study the effects of stress on performance. The data we are now collecting are changing our understanding of the nature of the performance disruption and allowing us to develop a more powerful model of the effects of stress on performance.

RN 92-23 Data Collection Instruments and Database for Assessment of Multiple Launch Rocket System (MLRS) Training Strategy, Hardy, G.D., Jr.; Banks, J.H. April 1992. (AD A250 170) When the Standards in Training Commission (STRAC) Weapons Program Review determined that the Multiple Launch System (MLRS) training strategy needed validation, the Individual and Unit Training Division (IUTD), Directorate of Training and Doctrine (DOTD), U.S. Army Field Artillery School (USAFA), requested that the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) perform a survey of MLRS training in Continental United States (CONUS) units. Structured interview guides and supplementary questionnaires were used to collect data on training programs now in use; unit conditions affecting training management and unit performance; unit performance on tasks; troop and command satisfaction with Training and Doctrine Command (TRADOC) training-support products; and tips for trainers and training managers, based on field reports and observations of what works. Data were collected from 225 personnel in 98 interviews at 5 CONUS Forces Command (FORSCOM) posts where MLRS units are as-

signed. The units visited included two MLRS battalions and three separate batteries. Data were collected from personnel at all echelons—from MLRS firing section through battalion or division artillery. Findings are presented in ARI Research report 1614, Assessment of Multiple Launch Rocket System (MLRS) Training Strategy. This Research Note contains appendices to that report, including the data collection instruments and the interview data.

RN 92-24 Canceled.

RN 92-25 Development of a Methodology for Collective Training Decision Making in Army Units, Roth, J.T. April 1992. (AD A250 061) For this research, regression equations to predict performance change for unit collective tasks were developed from subject matter expert (SME) estimates of performance under various conditions. Equations for tasks performed by five Infantry and Armor unit types and a conceptual model process for making collective training decisions were developed. Researchers developed, applied, and validated categorization schemes for identifying the likely effects of time without training and turnover in unit membership. User guidance for identifying collective training needs, developing strategies to satisfy the needs, and selecting appropriate training modes for unit training was developed from the other products of the research.

RN 92-26 Training in Multiple Launch Rocket System Units, Roth, J.T. April 1992. (AD A250 140) For this report, researchers used a survey to determine the status of training and performance proficiency in five field artillery units equipped with the Multiple Launch Rocket System (MLRS)—two MLRS battalions and three MLRS separate batteries. Ninety-eight interviews with 225 unit personnel were conducted. Questionnaires on unit performance, training detractors, and training resource

availability were completed, and documentary material on training was gathered from units. Researchers analyzed the information gathered to determine the guidance available to MLRS units for training, the training that was planned and actually conducted, the performance evaluation methods used, the training issues and problems encountered by units, and the relationships between these conditions and unit performance proficiency (reflected by confidence of unit members and higher echelon representatives in units' ability to successfully perform collective tasks). They concluded that MLRS units do not presently train in accordance with doctrine for employment of MLRS in combat. A number of factors contributing to this situation were identified and recommendations for improving training in MLRS units were formulated.

RN 92-27 Canceled.

RN 92-28 Toward a Fuzzy Theory of Performance Measurement, Mahan, R.P. April 1992. (AD A250 294) This report offers an alternative method for evaluating military unit performance. Fuzzy set theory is presented as a formal model of language expressions used in value judgments made by military experts. Further, it is suggested that fuzzy set theory may be used to connect the automated or instrumented physical measures taken from unit exercises with subjective judgments of expert military observers who interpret events in the framework of accepted concepts and principles of effective ground operations. Finally, the report documents a case study of a military domain of constructs wherein a sample of commanders identify three dimensions of communication and the semantic networks used to judge reports on these dimensions. The networks provide a sample group of interrelated terms that can be used to investigate the validity of fuzzy set operations for representing how expert observers describe and

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quantify aspects of communication performance.

RN 92-29 A User's Introduction to Determining Cost-Effective Trade-offs Among Tank Gunnery Training Methods, Morrison, J.E.; Hoffman, R.G. April 1992. (AD A250 029) Tank gunnery training devices are designed to decrease the costs and other resources required for training. To realize the potential resource savings of devices and, at the same time, maintain desired proficiency, cost-effective tradeoffs must be specified for device training and on-tank training. This report presents method for deriving and using these specifications. In addition, the report summarizes the support requirements for obtaining the data necessary for using the methods specified. The recommended approach is to obtain the data from actual performance-based gunnery data. At the same time, it was recognized that this may not be feasible. Because of this difficulty, an alternative judgment-based method, called "simulated transfer," is offered to generate surrogate performance data.

RN 92-30 Effectiveness of Contractor Mission Instructors in the 160th Special Operations Aviation Regiment Basic Mission Qualification Course, Bierbaum, C.R.; McAnulty, D.M.; Cross, K.D. April 1992. (AD A251 845) In response to a request from the Technology Applications Program Office, U.S. Aviation Systems Command, researchers conducted a training effectiveness evaluation of basic mission training for aviators assigned to the 160th Special Operations Aviation Regiment. The objective of the evaluation was to compare effectiveness of contractor and military instructors. Three classes of students attending the basic mission qualification training course, conducted by the Selection and Training Detachment, were evaluated. Student demographic data were used to divide the classes into two

groups. The grouping was based on flight time in assigned aircraft, total flight time, rank, age, highest qualification held, and experience with night vision goggles. One group was trained by contractor instructors and one group was trained by military instructors. Written examinations, flight evaluations, and part-task trainer procedure evaluations were administered throughout the course to compare the performance of the two groups. The instructors were rated by the students and an independent observer. Researchers found no significant differences between the training effectiveness of contractor and military instructors.

RN 92-31 The Identification and Prioritization of Light Infantry Research Issues, Shaneyfelt, S.E.; Lambert, G.G. April 1992. (AD A250 138) This report describes an attempt to identify and prioritize shortcomings and issues in Light Infantry doctrine and training. Information from U.S. Army Light Infantry doctrine publications, unit-specific programs, the U.S. Army Combined Arms Command, the Joint Readiness Training Center liaison officer from the U.S. Army Infantry School, computerized data bases, and other miscellaneous sources was examined. The initial review and analysis resulted in identifying over 170 training and doctrinal shortcomings. After further analysis, 154 shortcomings were evaluated by 17 subject matter experts serving in battalion staff positions in a Light Infantry division. Evaluations were based on the following criteria: (a) the overall effect of the shortcoming on the ability of the Light Infantry unit (squad through battalion) to successfully accomplish combat missions; (b) the influence of the shortcomings on battlefield operating systems (BOSs)—which BOS was most affected; (c) the nature or source of the shortcoming (i.e., doctrine, training, organization, or equipment problems); and (d) the level within the organization where a particular shortcoming had the greatest influence (i.e., squad, platoon, company, bat-

talion, brigade, division, or corps). From this analysis, 49 shortcomings were identified as critical to Light Infantry unit combat success. These shortcomings fell into five of the seven BOSSs. There was a general consensus on the importance of these shortcomings across the various data sources. The shortcomings were prioritized, based in part on research feasibility and the expected benefits of the research in enhancing Light Infantry unit combat effectiveness.

RN 92-32 Assessment of Army Aviators' Ability to Perform Individual and Collective Tasks in Aviation Networked Simulator (AIRNET), Smith, B.W.; Cross, K.D. April 1992. (AD A250 293) This research evaluates the training effectiveness of the Aviation Networked Simulator (hereafter referred to as AIRNET). The research was designed to (a) assess experienced crewmembers' ability to perform selected individual and collective tasks in AIRNET and (b) identify the specific design attributes that makes it difficult for crewmembers to perform tasks to standards in AIRNET. Because the research examined only in-simulator performance, inferences about the device's training effectiveness can be drawn only from data indicating that experienced crewmembers cannot perform a task effectively in AIRNET. Specifically, it is assumed that tasks cannot be trained effectively in a device if they cannot be performed adequately in that device. Transfer-of-training studies are required to assess the AIRNET's effectiveness for training tasks that can be performed adequately in the device. The report presents detailed data on the relative effectiveness of crewmembers performing the individual and collective tasks investigated. The report also presents detailed data on crewmember ratings of the adequacy of AIRNET for both performing and training specific tasks and conclusions and recommendations about the need to modify the design of AIRNET components.

RN 92-33 Light Infantry Performance at the Combat Training Centers: Home Station Determinants, Dyer, J.L.; Fober, G.W.; Pleban, R.J.; Salter, M.S.; Valentine, P.J.; Thompson, T.J. April 1992. (AD A250 502) The Training Systems Research Division of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has been conducting a multiyear research program designed to increase unit combat capability. The program goal is to identify, develop, and evaluate improvements in unit home station preparation for combat based on changes in training management policies and procedures. A general officer advisory group identified six areas for unit capability research: resources, training management, personnel stability, personnel quality, cohesion, and leadership. Both heavy- and light-manuever battalions are being examined. The ARI Field Unit at Fort Benning is responsible for research on Light Infantry capability. This report summarizes the results from the first year of research with the Light Infantry battalions. The first year identified correlates of combat readiness and areas where training and/or training management innovations would improve unit performance. Combat readiness was measured by performance at combat training centers (CTCs), primarily the Joint Readiness Training Center (JRTC). Performance trends identified many areas for training innovations and future research: staff training and synchronization, small-unit training for night operations, incorporation of combat realism in training, management of internal personnel stability, casualty evacuation procedures, and preparation of leaders to conduct home station training. Future research at the Fort Benning Field Unit will examine small-unit training for night operations and staff training and synchronization.

RN 92-34 Operation Desert Shield/ Storm After Action Report, Bynum, J.A. May 1992. (AD A251 212)

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This research note chronicles ARI's response to the challenges of Operation Desert Shield/Storm, and reports on the programs brought forward to assist our own and allied soldiers during the emergency.

RN 92-35 A Taxonomy for Predicting Team and Collective Task Performance Change, Roth, J.T. May 1992. (AD A252 562) For this report, a model of the factors that determine team performance was derived and used to develop a classification system for predicting collective performance change resulting from two factors—skill decay from the passage of time and team membership change. The information in this report will be incorporated into a future report, along with information on attempts to validate the classification system.

RN 92-36 Empirical Development of a Scale for the Prediction of Performance on a Sustained Monitoring Task, Pierce, L.G.; Crumley, L.M. May 1992. (AD A252 443) Research on vigilance performance has been extensive, but few guidelines exist for selecting persons well suited to perform vigilance tasks. The focus of this pilot study was to determine if a subset of items from the Minnesota Multiphasic Personality Inventory (MMPI) that would discriminate between soldiers able to sustain an adequate level of performance and soldiers whose performance deteriorated over time could be identified. Thirty-nine items produced chi-squares with p values less than .05. A discriminant analysis correctly classified 88.5% of the soldiers maintaining their performance rate of 83.9% of the soldiers with performance degraded over time. If validation efforts are successful, it may be possible to use the 39-item scale to select soldiers who will, on average, detect 13% more targets an.

RN 92-37 Computer-Aided Acquisition and Logistic Support Interface

Requirements Report, Park, J.S. May 1992. (AD A252 377) The Joint Service Instructional Systems Development/Logistic Support Analysis Record (ISD/LSAR) Decision Support System (DSS) is a major Department of Defense (DoD) initiative to integrate training system development with other weapon system design activities. Concurrently, the DoD Computer-Aided Acquisition and Logistic Support (CALS) initiative requires the development of standard weapons system databases that support front-end logistics, training, and performance analyses of new or emerging weapons systems. This report details the interface requirements to produce a PC-based automated Joint Service ISD/LSAR analysis.

RN 92-38 Canceled.

RN 92-39 Feasibility Study for Predicting Human Reliability Growth Through Training and Practice, Lowry, J.C.; Rappold, V.A.; Copenhaver, M.M. May 1992. (AD A252 371) This report examines the feasibility of developing a stand alone, quantitative Human Reliability Growth Model (HRGM) that predicts the impact of training variables on soldier performance. Such a model would incorporate learning curve fitting techniques to predict the impact of training variables on performance and would be based on empirical data from the behavioral and social science literature and available government data bases. This report describes the effort to collect empirical data on the effects of learning and practice on human performance. In addition, the report contains a review of the theoretical literature involving human learning and practice in which the nature and application of learning curves and curve fitting techniques are derived summarized. The results of this effort reveal that, out of approximately 3,000 research titles and abstracts reviewed, only 27 articles meet minimal criteria for use in developing the HRGM.

It was concluded that, although a theoretical basis for developing an HRGM exists, the data could not support it.

RN 92-40 Observing Team Coordination within Army Rotary-Wing Aircraft Crews, Thordsen, M.L.; Klein, G.A.; Wolf, S. May 1992. (AD A252 234) The purpose of this project was to demonstrate the feasibility of using team decision models to help train crew coordination in the tactical helicopter domain. Ten aircrews were studied as they performed a tactical mission in a UH-60 simulator facility at Fort Campbell, Kentucky. The results indicate that the methods can be adapted for observing team decision-making processes during some types of helicopter missions. Five opportunities for aircrew coordination training were identified: rehearsing mission functional profiles, analyzing commander's intent during pre-planning sessions, focusing the time horizon, avoiding micromanagement, and getting cues for anticipation/confirmation during the actual mission. Recommendations were presented for training observers and instructors to use these categories.

RN 92-41 Investigation of the influence of Air Defense Artillery on Combat Pilot Suppression and Attrition Management Practices, Headley, D.B. May 1992. (AD A252 249) Performance under combat conditions should equal the best levels achieved under training conditions. However, wartime performance may be degraded by the suppressive (psychological, indirect, or deterrent) effect of enemy weapons. This report examines the effect of air defense artillery (ADA) on air-to-ground missions. The methodology focuses on searches of the stress-and-performance and aviation combat literature, pilot interviews, and analysis of aviation tactics. A definitional framework of the concepts of actual and virtual suppression and attrition is presented. Command-and-control at-

trition management practices are examined, and examples from recent and past warfare are provided. Suppression was studied from the points of view of the performance-in-dangerous environments literature and cockpit workload. Examples of air-crew reactions to air defense artillery are included, and a summary chart lists pilot and mission characteristics influencing accuracy in weapons delivery. The authors conclude that (a) effective ADA can indirectly affect the otherwise effective firepower of attack aircraft through attrition management—safer attack profiles to preserve pilot and aircraft resources, (b) high cockpit workload in a threat-rich environment can contribute to suppression of pilot performance because of task overload, and (c) pilot-induced practice.

RN 92-42 Instrumentation Requirements for Collecting Soldier Performance Data, Wilkinson, T.D.; Copenhaver, M.M.; Crumley, L.M. May 1992. (AD A252 977) This report describes the four steps used to determine the best equipment to use for collecting soldier performance data. Special attention was paid to field data collection, where operational requirements often restrict the data collection capability. The four steps involve (a) conducting structured interviews with experienced research persons, (b) analyzing questionnaires mailed to researchers, (c) preparing a list of the data collection instrumentation identified, and (d) locating sources for the equipment items and doing trade-off analyses to identify the most cost-effective supplier. The equipment needed fell into six classes: (a) audio, (b) video, (c) support and selected supplementary, (d) environment and weather, (e) work space, and (f) psychological and physiological. This report does not include the equipment specification, source, and cost data.

RN 92-43 Canceled.

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RN 92-44 ACADIA: A Cognitive Typology of Tactical Decision Tasks, Sidorsky, R.C. June 1992. (AD A252 150) This report proposes an approach to the design of expert system decision aids based on categorizing tactical decision tasks in terms of the limited number of dilemmas inherent in military command and control (C2) operations. Six types of dilemmas are distinguished in the ACADIA typology of tactical decision tasks. These dilemmas are occasioned by the need for the following types of actions as outputs of the C2 cycle: acceptance (of a hypothesis), change (of a course of actions as outputs of stream), anticipation (of the future tactical interface), designation (of resources to be assigned), implementation (of an action), and adaptation (to a catastrophic event). The ACADIA typology provides a framework for development of generic C2 expert decision aids based on users' cognitive needs. The author discusses some of the operational and training implications of generic expert decision aids based on the ACADIA approach.

RN 92-45 1986 Proteus Survey: Technical Manual and Codebook, Harris, B.C.; Wochinger, K. June 1992. (AD A253 746) The 1986 Proteus Survey conducted by the United States Military Academy (USMA) is part of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) continuing research on officer careers. In 1987, the Proteus Survey was administered by ARI. In 1988, Proteus surveys were reviewed and expanded and became the Longitudinal Research on Officer Careers (LROC) Survey. Data for this survey have been collected annually since 1988. For the 1986 Proteus Survey, approximately 6,000 surveys were mailed to officers commissioned 1980-1985. Completed surveys were received from 3,220 officers. This report describes the 1986 Proteus Survey and database. It includes a complete codebook with frequencies and descriptive statistics for each of the 168 ques-

tions. The 1986 and 1987 Proteus databases and the LROC databases provide the necessary data to track factors that influence officer career decisions and behavior. These databases also provide a basis for evaluating the effects of policy changes and events on officers' attitudes and behavior.

RN 92-46 1987 Proteus Survey: Technical Manual and Codebook, Harris, B.C.; Wochinger, K. June 1992. (AD A254 781) The 1987 Proteus Survey was based on the 1986 Proteus Survey designed by the United States Military Academy and administered by Michigan State University. The Proteus Survey was transferred to the US Army Research Institute for the Behavioral and Social Sciences (ARI) by the Vice Chief of Staff of the Army as part of its retention and recruitment research. In 1988, the 1986 and 1987 Proteus survey.

RN 92-47 Development of Rating Instruments and Procedures for Aviation Mishap Investigation, Simon, R.; Pawlick, E.A, Sr.; Bronkhorst, T.M. June 1992. (AD A253 072) This report summarizes the development of improved techniques, procedures, measures, and reporting methods for identifying and reporting aircrew coordination errors in U.S. Army aviation mishaps. Based on an analysis of historical aviation accident data, researchers identified a number of recurring crew coordination errors that have contributed to rotary wing accidents. The errors were categorized and used, along with a theoretical framework and associated set of rating instruments, to produce a supplemental set of investigation and reporting procedures for U.S. Army aviation mishap investigations. The supplemental investigation and reporting procedures were demonstrated and validated in the field in three Class A aviation mishap investigations conducted during the summer of 1990. Participating research psychologists accompanied the U.S. Army Safety

Center accident investigation board to assess and refine the procedures in actual use.

RN 92-48 User's Manual for Assessing Individual and Group Performance During Battle Planning Exercise, Rappold, V.A.; Wilkinson, T.D.; Pierce, L.G. June 1992. (AD 253 745) This report is a manual for users of the three Graphic Rating Scales (GRSs) previously developed to assess small group and individual performance of students playing a simulated battlefield command and control exercise while attending the Officer's Advanced Course (OAC) at the United States Army Field Artillery School (USAFAS) at Fort Sill, Oklahoma. Each item on the GRSs is described in detail, the criteria used to evaluate student performance are clearly presented, and preliminary estimates of the reliability of the scales are reported. The manual also contains an overview of the Small Group Instruction Practical Exercises (PEs), including descriptions of the Command Estimate Process, PE staff positions, and the tactical and technical aspects of the Fort Irwin PE. In addition to providing users with the information needed to assess performance, a detailed description of the data base system developed to store and generate reports from the data is presented. The data base system is composed of a menu-driven user interface and dBASE IV data files that allow the user to rapidly and easily enter or modify performance measure ratings and select up to six reports describing the data.

RN 92-49 Handbook for Operating OWLKNEST Technology, Harris, R.M.; Hill, S.G.; Lysaght, R.J.; Christ, R.E. June 1992. (AD A253 412) This handbook offers guidance to users of the operator workload (OWL) knowledge-based expert system tool (OWLKNEST). The handbook is an appropriate foundation for understanding the context within which O WLKNEST can be useful. The handbook describes (a) the concept of workload; (b) problems associated with deter-

mining which OWL assessment techniques are most appropriate for any given set of study objectives, system characteristics, and user resource constraints; and (c) the expert system approach to problem solving. The handbook also provides an overview of OWLKNEST and gives detailed instructions and specific examples for operating the tool and interpreting its output. Brief descriptions of each of the 38 OWL assessment techniques included in OWLKNEST and a survey from designed to solicit feedback from OWLKNEST users are in appendixes.

RN 92-50 Development of PER-Seval Performance Shaping Functions, O'Brien, L.H.; Simon, R.; Swaminathan, H. June 1992. (AD A252 820) This report describes how the Personnel-Based System Evaluation Aid (PER-SEVAL) performance shaping functions were developed. It describes how PER-SEVAL will use these functions to identify minimum levels of personnel characteristics for a particular contractor's design. Finally, procedures for future validation of the functions are outlined. The PER-SEVAL performance shaping functions were developed by conducting regression analyses of data obtained from the U.S. Army Research Institute for the Behavioral and Social Sciences' Project A database. They predict task performance as a function of personnel characteristics and training. Separate functions are provided for different types of tasks. Two types of training variables are used in the performance shaping functions—frequency and recency of practice.

RN 92-51 Meta Analysis of Aircraft Pilot Selection Measures, Hunter, D.R.; Burke, E.F. June 1992. (AD A253 387) For this research, the meta-analytic procedures described by Hunter and Schmidt in 1990 were applied to a database of 476 correlations based on an overlapping sample of 432,324 cases. These correlations were obtained from a review of the research literature

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on aircrew selection published from 1920 to 1990. Over 200 studies that dealt with aircrew selection were identified. Of that number, 69 reported correlations between some independent measure and a pilot training performance criterion. Analyses were conducted of the overall aggregated set of correlations and subsets selected on the basis of date of study, type of predictor measure, type of aircraft, and sample characteristics. These analyses showed a decline in the mean validity correlations obtained over the previous 50 years. In addition, differences in the mean correlations were observed among the various types of predictor measures. In general, job sample measures were the best predictors of performance, followed by psychomotor coordination and biographical inventories. Possible applications of the results in the interpretation of previous research and in the design of future research are discussed.

RN 92-52 Experimental Assessment of Problem Solving at the Combined Arms and Services Staff School, Lussier, J.W.; Solick, R.E.; Keene, S.D. June 1992. (AD A253 386) An important dimension of group problem-solving situations is the degree to which responsibility for task performance is distributed among group members. In some situations, such as juries, each member shares the same information and performs the same tasks as other members. In other situations a problem is subdivided, and individuals or subgroups work different aspects of it. For this research the problem—VARWARS—required the group to subdivide and work highly interdependent subproblems. Groups of students at various stages of completion of a 9-week course featuring problem-solving instruction were tested. Contrary to expectation, groups showed a significant and progressive decline in scores. Intact groups composed of students from the same class section performed worse than groups composed by mixing students from different sections.

The objective performance score associated with VARWARS seems to be a good indicator of group performance.

RN 92-53 Assessing Information Flow and Decision Making in a Field Artillery Command and Control Exercise, Wilkinson, T.D.; Bullock, M.C.; Pierce, L.G. June 1992. (AD A253 385) The U.S. Field Artillery School (USAFAAS) at Fort Sill, Oklahoma, uses a computer-supported Command post exercise (CPX) to train soldiers attending classes in Field Artillery Fire-Support, Control, and Communications. The students, divided into groups, act as the fire support, operations, intelligence, and fire direction elements of a Field Artillery Battalion supporting a Mechanized Infantry Brigade conducting offensive operations in a European environment. The students receive a total of 450 computer-generated messages in TACFIRE formats and, at each position, must make decisions and respond to the battlefield situation. The CPX scenario was analyzed to identify performance measures that could be obtained by modifying the CPX software or by videotaping one or more of the sections. This report provides (a) a detailed description of the CPX (scenario, hardware, and software, and facilities) used at the USAFAAS, (b) a list of the proposed performance measures, and (c) a description of the modifications made to the CPX software to allow for the performance data collection and reporting.

RN 92-54 Development of a Computer-Supported Data Collection System to Measure Soldier Performance on the Institutional Fire Control System Trainer, Kaye, R.D.; Hu, X.; Pierce, L.G. June 1992. (AD A252 886) This report describes a data collection system developed to interface with Institutional Fire Control System Trainers (IFCSTs), which are trunk-size M109A6 Paladin howitzer Automatic Fire Control Computer System (AFCS) simulators.

The IFCST simulates tasks performed by the Paladin chief-of-section when interfacing with the actual Paladin AFCS. The IFCST Data Collection System (DCS) links a data collection microcomputer with up to 18 individual IFCST units, records individual performance on scenario function (e.g., total number of errors committed during a scenario, total time required to complete a scenario, and total number of keystrokes required to complete a scenario), and stores these data in dBASE IV data files. The dBASE IV system then generates three types of reports summarizing the data at varying levels of detail.

RN 92-55 Methodology for Conducting Analyses of Army Capabilities,

Wagner, M.P.; O'Brien, L.H.; Clark, H. June 1992. (AD A254 512) This report describes a methodology for conducting analyses of Army capabilities to support force modernization planning. This methodology parallels the Army's Concept Based Requirements System (CBRS). The methodology can be divided into four phases: (1) the analysis of missions, (2) the assessment of capabilities, (3) the identification and assessment of capability improvements, and (4) tradeoff analysis and development of capability improvement plans. The report also includes a description of a process for incorporating the results of capabilities analysis into requirements specifications for capability improvements (e.g., weapon system enhancements). A number of tools that are an integral part of conducting capabilities analysis were developed in conjunction with the methodology. The first tool is the "operation template," which can be used to analyze missions to determine operational requirements. A comprehensive listing of operation types is included, as well as a discussion of how to develop templates. The second tool is the Blueprint of the Battlefield (TRADOC Pamphlet 11-9). The Blueprint is a comprehensive, hierarchical listing of the activities the Army performs in and in support of military operations.

It is used to break missions and operations into their essential performance elements. The third tool is a set of measures of effectiveness (MOE) that can be used to assess performance and a methodology for developing MOE. MOE are essential to the measurement and evaluation of battlefield task performance and its relationship to mission success. The fourth tool is a taxonomy of conditions that can be used to structure descriptions of the physical and operational environment in which combat is being examined. This taxonomy is particularly important to the measurement of human performance since humans tend to be more sensitive than equipment to many of the conditions inherent in combat. The methods and tools included in this report provide a horizontally and vertically integrated structure for conducting analyzes. The structure integrates horizontally by being functional. That is, it provides opportunities to conduct tradeoffs across branches and proponents, as well as across the five principle domains of capability (doctrine, training, leadership, organizations, materiel). It integrates vertically by being applicable across echelons and the levels of war (tactical, operational, and strategic).

RN 92-56 Predicting Target Detection Performance Using ASVAB Subtests and Cognitive Factor Tests,

Crumley, L.M.; Pierce, L.G.; Schwalm, R.C.; Coke, J.S.; Brown, J.C. June 1992. (AD A257 851) For this research, a simulation of a remotely piloted vehicle (RPV) Sensor Station Operator situation was created in which soldiers who had completed initial training were required to seek and report targets that appeared on a black and white TV screen. Targets were military vehicles, buildings, and other manmade objects that appeared in 90 of 1,440 photos taken from a helicopter flying over and near Fort Sill, OK. When transferred to videotape these photos

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appeared for 4.5 seconds, with a 15-second dark period between views. This process resulted in a 2-hour presentation that appeared to be an uninterrupted overflight. Subjects were also given six cognitive tests representing three cognitive factors (speed of closure, flexibility of closure, and perceptual speed), and ASVAB subtests were obtained and biographic information was collected. The speed of closure, measured by the Gestalt completion, Concealed Words, and Snowy Pictures tests—all of which are significantly correlated—and several biographic items correlated beyond the $p=0.05$ level, but ASVAB test scores did not significantly correlate. One of the two flexibility of closure tests, Hidden Figures, was significantly correlated, but the overall factor correlations were not significant when Hidden Pattern score was merged to create a single factor value. Biographic items implied that persons who fished, were not heavy coffee drinkers, and did not need glasses performed better.

RN 92-57 An Analysis of Proposed 97E10 Selection Characteristics, Marshall, P. June 1992. (AD 254 714) For this report, an analysis of proposed characteristics of Military Intelligence interrogator personnel and performance in interrogator training was conducted. This analysis is part of a broad-based initiative by the Department of Human Intelligence (HUMINT), U.S. Army Intelligence Center in Fort Huachuca (USAIC&FH), to improve interrogator characteristics using marker tests, the Myers-Briggs Type Indicator (MBTI), the California Psychological Inventory (CPI), biographical data, and other pertinent personnel proficiency scores (e.g., ASVAB, DLPT), and relate these measures to several performance milestones in the interrogator training process. A total of 170 97E10 students participated. The overall analysis yielded several significant but low-order correlations between predictor measures and performance criteria, particularly with scale

scores from the CPI and ASVAB. An important consideration was the need for more precise measures of interrogator performance vice academic scores. Further work is suggested using scenario-based data collections in one-on-one interrogation situations.

RN 92-58 HARDMAN III: A Patriot

Growth Application, Sams,

M.R. June 1992. (AD A253 534) With assistance from the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Fort Bliss Field Unit, the Directorate of Combat Developments (DCD), U.S. Army Air Defense Artillery School at Fort Bliss, Texas, is evaluating HARDMAN III. DCD and ARI at Fort Bliss have applied the HARDMAN III methodology to a proposed improvement (Navigation Emplacement System) to the Patriot Air Defense System. HARDMAN III analyses include system performance requirements and projected manpower and personnel characteristics for Patriot MOS in the fielding years; also included were workload analyses and analyses of the effects of personnel quality and training and environmental stressors on mission performance. The Patriot Growth Application is a good example of the concept, methodology, and output of HARDMAN III analyses through user participation on an actual system. This research note is in a modular communication (briefing) format.

RN 92-59 Evaluation of the Prototype

Data Analysis Job Aid, Haught,

D. June 1992. (AD A254 690) The Position Data Analysis Job Aid (PDAT-JA) software is a product of research accomplished during earlier phases of the Military Occupational Specialty (MOS) restructuring research and development program conducted by the U.S. Army Research Institutes for the Behavioral and Social Sciences (ARI). The software, released for demonstration in December 1990, automates much of the position data analysis process performed during MOS restructuring. This re-

port (1) provides a synopsis of the development of PDAT-JA, (2) defines the role of the software in the MOS research and development program, and (3) provides the results of the operational evaluation if the prototype software.

RN 92-60 Development of the Blueprint of the Battlefield, Gibbings, L.G.; Wagner, M.; Morey, J.; Grubb, G. July 1992. (AD A255 007) The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), under the sponsorship of the Director, Force Development, Headquarters, Department of the Army (HDQA), and the Assistant Deputy Chief of Staff for Concepts and Doctrine, HQ, Training and Doctrine Command, developed blueprints for the tactical, operational, and strategic levels of war. The Blueprint collectively includes three separate blueprints, one for each level of war. The Blueprint is a common reference system for field commanders, combat developers, analysts, trainers, and planners who analyze and integrate operations. As such, the Blueprint helps staff and field organizations relate Army needs to Army missions and provides a basis for describing Army requirements, capabilities, and combat activities at the three levels of war. This report discusses the background for completing the final Blueprint, as well as methods used for researching and developing the Blueprint, the three levels of war, and each of the three blueprints. It discusses applications of the Blueprint and limitations and linkages among the blueprints. It also includes a summary of issues that require decisions by Army sponsors. Finally, the report provides the end product of the project as appendixes (i.e., Blueprints of the three levels of war).

RN 92-61 Operator Workload Predictions for the Revised AH-64A Workload Prediction Model: Volume I:

Summary Report, Hamilton, D.B.; Bierbaum, C.R. July 1992. (AD A254 198) Under a previous contract, researchers used a composite scenario to conduct a comprehensive task analysis of the AH-64A attack mission. The analysis produced workload estimates and decision rules for developing and AH-64A workload prediction model. For this research, the task analysis/workload (TAWL) methodology was used to construct a workload prediction model. The TAWL Operator Simulation System (TOSS) was used to implement the model on an IBM-compatible microcomputer, and the original function and task analysis was refined to produce a more accurate simulation of crew task activity. In addition, the original workload rating scales used in the original analysis were replaced with equal-interval scales. The predictions generated by the model constructed for this research indicate that under optimum conditions (a) neither the pilot nor the copilot/gunner experiences excessive workload, (b) the pilot has higher overall workload than the copilot/gunner in most mission segments, and (c) AH-64A workload is high relative to other Army aircraft that have been analyzed for workload. This model can be used as a baseline for analyzing future modifications to the aircraft. This report (Volume I) describes the methodology, summarizes the results of the research, and contains a 5.25-inch floppy diskette with model data files. Volume II (ARI Research Note 92-62) contains the appendixes, which present the AH-64A mission/task/workload analysis, decision rules, and workload predictions.

RN 92-62 Operator Workload Predictions for the Revised AH-64A Workload Prediction Model: Vol II: Appendixes A-H, Hamilton, D.M.; Bierbaum, C.R. July 1992. (AD A254 939) Under a previous contract, researchers used a composite scenario to conduct a comprehensive task analysis of the AH-64A attack mission. The

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analysis produced workload estimates and decision rules for developing and AH-64A workload prediction model. For this research, the task analysis/workload (TAWL) methodology was used to construct a workload prediction model. The TAWL Operator Simulation System (TOSS) was used to implement the model on an IBM-compatible microcomputer, and the original function and task analysis was refined to produce a more accurate simulation of crew task activity. In addition, the original workload rating scales used in the original analysis were replaced with equal-interval scales. The predictions generated by the model constructed for this research indicate that under optimum conditions (a) neither the pilot nor the copilot/gunner experiences excessive workload, (b) the pilot has higher overall workload than the copilot/gunner in most mission segments, and (c) AH-64A workload is high relative to other Army aircraft that have been analyzed for workload. This model can be used as a baseline for analyzing future modifications to the aircraft. Volume I (ARI Research Note 92-61) of the report summarizes the results of the research, and contains a 5.25-inch floppy diskette with model data files. This report (Volume II) contains the appendixes, which present the AH-64A mission/task/workload analysis, decision rules, and workload predictions.

RN 92-63 An Evaluation of Crew Coordination and Performance During a Simulated UH-60 Helicopter Mission, Thorton, R.C.; Kaempf, G.L.; Zeller, J.L., Jr.; McAnulty, D.M. July 1992. (AD A254 984) This research was designed to develop measures of aircrew coordination and mission effectiveness and to identify crew coordination training requirements for U.S. Army rotary-wing flight. Twenty crews planned and constructed a three-segment mission scenario in the UH-60 Flight Simulator that exposed crews to situations requiring coordination. Crew performance and communications were

recorded during the final two scenario segments and three mission effectiveness measures were developed from the records: navigational accuracy, threat avoidance and evasion, and instrument approach. Communication rate, topics, functions, and content areas were analyzed as indexes of crew coordination. The results indicate that substantial differences in performance and communication profiles exist between crewmembers and across mission segments. There were significant relationships between crew coordination levels and performance on the three mission tasks. The results also indicate the need for aircrew coordination training program.

RN 92-64 Multipurpose Arcade Combat Simulator Development to Improve Soldier Shooting Skills with the M16A3 Rifle, Osborne, A.; Smith, S. July 1992. (AD A254 512) This report provides details of the effort (February to December 1991) to produce a Multipurpose Arcade Combat Simulator (MACS) program for the M16 rifle with telescope (M16A3). Because the Army delayed selection of a telescope, all aspects of the program could not be completed; programs were developed using the telescope reticle with the highest probability of selection. The program may be fired with telescope or iron sights. It reviews basic marksmanship, the long-range engagement of stationary and moving targets, the effects of wind, and the combined effects of range, wind, and target movement.

RN 92-65 Criterion-Referenced Testing: A User's Resource, Dressel, D.J.; Mirabella, A. July 1992. (AD A254 290) To provide Army trainers and test-development personnel with basic information and guidance on the rationale and development of criterion-referenced tests (CRTs), a literature review was performed on issues relating to CRT development over the past 15 years. The results of this search were divided into eight

topical areas, and an overview of essential principles and an annotated bibliography were written for each of these topical areas. Test developers can use the indicated references for a detailed explanation of issues to address and procedures to follow to produce a valid CRT.

RN 92-66 Motor Control in Keyboard Tasks and Research on Morse

Code Copy, Mullins, P.A. July 1992.

(AD A257 679) A review of biomechanical and motor behavior characteristics of rapid finger responses and current issues in motor behavior is related to development of the skill of receiving Morse code. Previous research on Morse code provides the background for three experiments described in this report that investigated the organization of component process in the Morse code copy task, with particular attention to the motor response.

Experiment 1 examined the effects of variables related to component processes of the Morse code copy task. Experiment 2 studied the motor response component of the copy task. Experiment 3 analyzed cognitive organization and response preparation for a motor task using Morse code stimuli. The principal findings were that the pattern of elements constituting a Morse code signal was the only significant variable influencing response time; vocal reaction time to Morse code was longer than keyboard entry of the character; subjects separated into groups based on their ability to perform the speeded Morse copy task; and successful subjects demonstrated evidence of superior response and preparation. The results help clarify the process of skill acquisition in the Morse code copy task and suggest implications for predicting successful performers and for improving training methods.

RN 92-67 Canceled.

RN 92-68 Development of Measures of Crew Coordination, Simon, R.; Risser, D.T.; Pawlik, E.A., Sr. July 1992.

(AD A255 384) This report describes the development of a reliable, objective, and quantitative set of metrics for measuring and assessing aircrew coordination in terms of aviator performance and safety. Based on a review of programs to evaluate aircrew coordination in the commercial and military sectors, three rating instruments were developed for specific application to UH-60 helicopter aircrews. These instruments included a military adaptation of the Cockpit Management Attitudes Questionnaire (CMAQ), the Aircrew Coordination Evaluation Checklist, and a revised set of Aircrew Training Manual (ATM) maneuver standards. All three instruments were used by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to evaluate UH-60 aircrews in May 1990 at Fort Campbell, Kentucky. Data from this experiment are being analyzed by ARI and will provide a basis for developing training standards and methods in this area.

RN 92-69 Combat Maneuver Training Center Data in the ARI Combat

Training Center Archive, March 1992,

Hardy, G.D., Jr. July 1992. (AD A255 008)

This report presents the results of the first step in a four-step effort to assess and improve the utility of Combat Maneuver Training Center (CMTC) data in the U.S. Army Research Institute Combat Training Center Archive. The objective of this effort is to integrate the CMTC data into the body of data remotely accessed by the Combat Operations Research Facility. The report surveys the materials in the CMTC databank and describes the materials by content, media, and format. Finally, the report summarizes steps under way and projected to enhance the utility of the data.

RN 92-70 Training Planner's Guide [Collective Task Training Decisions for Light Infantry and Mechanized Infantry Units], Roth, J.T. July 1992.

(AD B166 852) This report is intended as a

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user-oriented guide, derived from research on factors affecting collective skill retention. The research on which it is based is documented in two U.S. Army Research Institute for the Behavioral and Social Sciences Research Notes: 1. A Taxonomy for Predicting Team and Collective Task Performance Change. 2. Development of a Methodology for Collective Training Decision Making in Army Units.

RN 92-71 Update of the U.S. Army Research Institute's Longitudinal Research Data Base of Officers, Younkmann, D.D.; Ramsey, L.J.; Fertig, K.L. August 1992. (AD 255 966) This document describes the procedures used to augment the Officer Longitudinal Research Data Base (OLRDB). The OLRDB is organized as six data sets that contain personnel, pre- and postcommissioning training, and field performance data for Army officers. The OLRDB data sources include the Officer Master File (OMF), the Separation Officer Master File (SOMF), the Automated Instructional Management Systems (AIMS), the U.S. Military Academy (USMA) Cadet File, the Army ROTC Commissioning files, and the Army ROTC Advanced Camp files.

RN 92-72 Update of the U.S. Army Research Institute's Longitudinal Research Data Base of Enlisted Personnel, Ramsey, L.J.; Urynowicz, B.T.; Younkmann, D.D. August 1992. (AD 255 965) This document describes the procedures used to augment the Enlisted Personnel Research Data Base (EPRDB). The EPRDB consists of longitudinal records that contain both personnel data and selected career history for soldiers who enlisted in the Army between 1974 and 1990. It is composed of two data sets.

RN 92-73 Career Intentions of Army Officers: Educational Factors, Guthrie, T.J. August 1992. (AD A260 156)

This report examines the relationship between the college major and the career intentions of company-grade Army officers. The research tests a simple regression model that predicts expected years of service in the Army from college major and a composite gender-source of commission variable. Officer data from the 1988 administration of the Longitudinal Research on Officer Careers (LROC) survey of officers provided data on demographic and educational variables. Separation behavior through fiscal year 1990 from Officer Longitudinal Research Data Base (OLRDB) was matched with the 1988 LROC survey data. Gender, source of commission, and college major accounted for only 9% of the variance in career intentions. Officers who separated in the earlier year groups are not accounted for in the findings and may have more marketable college degrees. Trends in academic major categories of separated and active-duty officers should be examined by year group. The results suggest that educational and demographic variables should be examined by year group. The results suggest that educational and demographic factors should be included in career intention models and that other demographic factors should be explored.

RN 92-74 Selection and Classification Tests for Critical Military Occupational Specialties, Oppler, S.H.; Peterson, N.G.; Whetzel, D.L.; Steele, D.; Childs, R.A.; Park, R.K. August 1992. (AD A256 160) This report presents research on issues affecting the readiness of new Army personnel tests for implementation. These tests are from the battery developed under the Army's Project A to supplement the Armed Services Vocational Aptitude Battery (ASVAB). Specific tests were chosen for this research because they are being considered by the Department of Defense for implementation in preenlistment selection and classification. For this research, in 1990 new recruits at Fort Knox and Fort Benning took computerized tests of spa-

tial, perceptual, and psychomotor abilities. Three possible sources of extraneous variance in the test scores were investigated: order effects, practice effects, and effects of changes in test instructions. In addition, pencil and paper versions of new biodata and spatial items were tested. As part of work to counteract falsification on self-report instruments, forms of the Assessment of Background and Life Experiences (ABLE) were administered under various instructional sets. Finally, scores for two of the computerized tests were compared with archival scores on pencil-and-paper versions from Project A to determine possible effects of medium of administration on test performance. Approaches to dealing with the sources of variance other than ability are discussed, and needs for follow-on research are identified.

RN 92-75 The Precision of Category Versus Continuous Economic Data: Evidence from the Longitudinal Research on Officers Careers (LROC) Survey, Dunn, L.F. August 1992. (AD A256 094) This research evaluates category versus numeric responses to questions in the U.S. Army Research Institute for the Behavioral and Social Sciences' Longitudinal Research on Officers Careers (LROC) Survey, which examines career intentions of junior Army officers. The assessment is based on the relative efficiency of estimates of regression model parameters. Efficiency is measured by the standard errors of coefficient estimates of models applied to category and numeric response data, respectively. The analysis consists of two parts. First, a Monte Carlo experiment is conducted. It estimates ordered logit models (OL) for category data and an ordinary least squares (OLS) regression model using numerical response data with measurement error. Second, the analysis of the LROC survey data involves estimation of ordered logit and OLS regression models. The categorical career intentions questions provide data for the dependent variables in the ordered logit models.

The dependent variable for the OLS model is the numeric response to the intention question. Sixteen explanatory variables that measure career-related variables (e.g., source of commission and branch satisfaction) and socioeconomic variables (e.g., gender) are included in each model. Findings indicate that standard errors of regression estimates are smaller for numeric than for categorical data. Further, the OLS model applied to the numeric response data confirm a key finding of the LROC project concerning the interaction effect of hours worked per week and branch satisfaction. The categorical response estimates fail to detect this effect.

RN 92-76 U.S. Army Survey of Nurses and Nursing Students: Sampling Frame and Survey Development, Lerro, P.; Morrison, J.; Ramsberger, P. August 1992. (AD A255 719) This report describes the rationale for the study of nurses and the development of the sampling frame and questionnaires for survey of registered nurses and nursing students. An understanding of the perceptions of the U.S. Army and Army nursing by registered nurses and nursing students is important to U.S. Army policymakers and recruiters. Development of the sampling frame for registered nurses involved the selection of states by cluster sampling, with the selection of respondents randomly within states. Development of the sampling frame for nursing students involved the selection of nursing schools by cluster sampling. The surveys ask a series of questions on education level, employment status, satisfaction with nursing, attitudes about the Army Nurse Corps Active Duty and Reserve programs, and the impact of Desert Storm and similar possible actions on feelings about joining the military.

RN 92-77 ACCES Assessment of Command and Control During a Division Level CPX - Late Spring 1991 (AC-

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CES Application 91-01, Castro, F.D., Jr.; Collingwood, C.E.; Ervin, J.R.; Halpin, S.M. August 1992. (AD A256 401) The Army Command and Control Evaluation System (AC-CES), under continued development by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), assesses Army command and control (C2) processes. This report documents ACCES application 91-01, a 5-day division-level command post exercise. The exercise identified several shortcomings in the division's C2 processes.

RN 92-78 ACCES Application of 91-02: ACCES Assessment of Command and Control during a Division Level CPX, Summer 1991, Castro, F.D., Jr.; Hicks, H.E., Jr.; Ervin, J.R.; Halpin, S.M. August 1992. (AD A256 433) The Army Command and Control Evaluation Systems (AC-CES), under continued development by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), assesses Army command and control (C2) processes. This report documents ACCES application 91-02, a 5-day division-level command post exercise. The report identifies several shortcomings in the division's C2 processes.

RN 92-79 Evaluation of Relative Importance Judgment Methods in the Context of Causal Prediction, Hamm, R.M. August 1992. (AD A255 718) This study investigated five methods for measuring the relative importance of situational factors in predicting mission success in a planning context. The methods were ranking, 2-category rating (yes or no), ratio scale rating (magnitude estimation), probability change, and necessity or sufficiency judgments. Interpersonal agreement was highest using the probability change method. Comparison of the importance profiles produced by the various methods showed that ranking, rating, and yes or no were most similar to each other. Respondents indicated their preference among the

methods and evaluated the methods' usefulness for a number of purposes. The ranking and probability change methods were most preferred and rated most useful.

RN 92-80 Canceled.

RN 92-81 Canceled.

RN 92-82 Data Management and Analysis in Support of the Army Family Research Program, Gonzalez, C. September 1992. (AD A256 905) This report details the processes and procedures used to transfer the Army Family Research Program (AFRP) Spouse Data Set, the Family Service Providers (SPF) Data Set, and the Installation and Community Characteristics Inventory (ICCI) Data Set from the National Institutes of Health mainframe computer to MS-DOS personal computer files for use by researchers at the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). Procedures include a discussion on the appropriate job control language (JCL) to use with the Spouse file stored as a SAS data set, the macros used to generate the spouse data book, and the use of the Kermit communications package to download files to a PC. Included are also procedures to compute appropriate standard errors using the SUDAAN software. Special emphasis is placed on the description of procedures used to generate the various files.

RN 92-83 Trainer's Guide: Multipurpose Arcade Combat Simulator (MACS): Moving Target Training, Osborne, A.D.; Smith, S. September 1992. (AD A257 680) The Multipurpose Arcade Simulator (MACS) is an inexpensive, computer-based rifle trainer that helps soldiers master perceptual/motor and cognitive shooting skills. To date, more than a thousand MACS devices are being used for basic and unit rifle marksmanship training throughout

the Army. This moving Target Trainer's Guide details a MACS cartridge that provides instruction on engagement of moving targets and gives several levels of practice that gradually increase skill and knowledge requirements. The guide also offers helpful instructor recommendations to assist trainers. The program cartridge and the accompanying copy of the Trainer's Guide for the Commodore computer version of moving Target MACS are available through the Fort Benning Training Support Center.

RN 92-84 Data Tables from Combat Vehicle Command and Control Battalion- Level Preliminary Evaluation, O'Brien, L.H.; Wigginton, D.; Morey, J.C.; Leibrecht, B.C.; Ainslie, F.M.; Sawyer, A.R. September 1992. (AD A258 580) The Combat Vehicle Command and Control (CVCC) research and development program addresses key issues associated with the automation of various command, control, and communications (C3) functions for tanks through the use of soldier-in-the-loop distributed interactive simulation. This report contains summary data tables from the CVCC Battalion-Level Preliminary Evaluation. For the evaluation, four groups, each consisting of 23 troops, completed a 1-week training and testing schedule culminating in two simulated combat scenarios. This effort used specially developed CVCC simulators and tactical operations center workstations located in the Close Combat Test Bed at Fort Knox, Kentucky. These simulation facilities supported both automated and manual data collection of mission/tactical performance and C3 performance during each combat scenario.

RN 92-85 Enlisted Personnel Allocation System Field Test Report, Konieczny, F.; Brown, G.; Stewart, J. September 1992. (AD A257 063) The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), with the assistance of the Gen-

eral Research Corporation, undertook a project to modernize and improve the way the Army determines an individual's initial-entry Military Occupational Specialty (MOS). The project developed the Enlisted Personnel Allocation System (EPAS). This report documents the results of the field test of EPAS. The primary objectives of the field test were verification of the conversion to, and operability on, the Army's Information Services Command—Pentagon (ISC-P) computer.

RN 93-01 Correlates of Creative Problem Solving, Stewart, S.R.; Angle, D.C. October 1992. (AD A258 720) The purposes of this research were to (a) identify individual differences related to unstructured problem-solving capability and (b) evaluate the effectiveness of a training course designed to enhance performance in solving unstructured problems. One group underwent training designed to teach thinking process skills. The second group underwent instruction about thinking and problem solving that was content (not process) oriented. Four predictors accounted for 60% of the criterion's variance. They were, in order of importance, mental rotations, use of "intuition," use of "introversion" (both as assessed with the Myers-Briggs Type Indicator), and risk-taking propensity. Students taking the thinking process training significantly outscored those taught only about problems and errors in human judgement and decision making.

RN 93-02 Micro Computer Programs to Assist in Assessing Managerial Potential, Hopkins, J.E. October 1992. (AD B 169 677) This report describes micro computer programs written to assist in the administration of the Career Path Appreciation (CPA). The CPA is a three-part interview designed to assess administrator to conduct a 2-to 3-hour interview. The Symbols, Phrases, and Work History micro computer programs allow a major portion of the data to be col-

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lected by the computer. With the use of the computer programs, the CPA can be administered more efficiently. Results are discussed.

RN 93-03 Performance Support Technology to Assess Training Effectiveness: Functional and Test-Bed Requirements, Mirabella, A.; Dressel, D.; Lawton, G. October 1992. (AD A257 805) For this report, we analyzed Training and Document Command (TRADOC) documents to determine what portions might be included in a performance support technology system for training development. The focus of this review was on the performance evaluation of the design phase of the Systems Approach to Training (SAT) and its automated version (ASAT). The review showed that a combination of procedural guide (i.e., job aid), tutorial, and test production tools could help implement TRADOC policy. A preliminary review of the job aid literature, however, indicated many gaps in our knowledge about how to design and combine performance support tools. Nonetheless, it provided some concrete ideas of how design effective performance support technologies (PST). We used these ideas to build a demonstration, computerized job aid/tutorial for constructing military occupational specialty Self-Development Tests (SDTs). Content for the demonstration product was derived from the SDT Writer's Workshop at the Quartermaster School. A hard copy version of the demonstration is included in Appendix J.

RN 93-04 Army Community Support Programs: Needs and Access

Among Army Families; Appendix with Supplementary Tabulations, Devine, P.; Bullman, S.; Gaston, M. October 1992. (AD A258 728) This report examines the patterns of community support program use among Army soldiers and their spouses. The data for the report are from a 1989 Army-wide survey of a probability sample of 11,035 sol-

diers in 528 active component Army units and 3,277 Army spouses. The report examines—

- The perceptions of program usefulness and the perceptions of Army policy impact on family members, the quality of Army family programs, and the helpfulness of Army community service personnel, and
- User demographic characteristics and indicators of potential program or service need for over 30 separate Army services.

Overall, patterns of program use vary by soldier rank and, to some extent, geographical location. All soldiers and spouses, however, believe that the Army community support services are essential to the well-being of the Army community.

RN 93-05 Army Manpower Cost System (AMCOS): Final Report, Black, M.; Rose, D.; Smith, A.; Eichers, D.; Hogan, P.; Hunter, R. November 1992. (AD A259 274)

This report describes a 5-year research and development effort that built a series of budget, economic, and life-cycle cost models for the Army's active, reserve, and civilian components. These models have helped to improve the accuracy and flexibility of the Army's manpower cost estimating capability. Application include estimates of life-cycle manpower costs of weapon systems and force structures; economic tradeoffs among active, reserve, and civilian manpower; cost implications of personnel policies; and budget decisions.

RN 93-06 Notes on the Modeling of Longitudinal Data, Tisak, J.; Wochinger, K. November 1992. (AD A259 347)

This report describes the growth curve approach to the modeling of longitudinal data from Project Proteus. Desirable properties of the model are presented along with the basic model. Using Project Proteus and data from the Officer Longitudinal Research Data Base (OLRDB), two variables reflecting career intentions and social support were modeled longitudinally. The models were evaluated using

chi-square and restricted chi-square tests in LISREL. The results of the exploratory analyses indicate significant effects for cohort and length of time in the Army.

RN 93-07 Officer Standardized Educational Testing Data, Ramsey, L.J.; Fertig, K.L. November 1992. (AD A259 393) This report describes the procedures used to develop the Officer Standardized Educational Testing Data Base. To develop the data base, standardized test score data were added to existing officer longitudinal and survey data. Test score data and historical information for academic years 1973-1974 through 1984-1985 were collected from the Educational Test Service (ETS) for the Scholastic Aptitude Test (SAT) and American College Testing Program for the American College Test (ACT) for a select group of officers. The sample group included Army officer personnel commissioned between 1980 and 1990 from the 1990 Officer Longitudinal Research Data Base, 1986-1987 Proteus, and 1988-1990 Longitudinal Research on Officer Careers data sets.

RN 93-08 Catalog and Assessment of the Manpower and Personnel Research Division Data Bases, Holloway, J.L.; Tao, F.; Ramsey, L.J.; Payne, R.C.; Haupt, A.L. November 1992. (AD A259 929) This document describes the procedure used to develop a computerized catalog of research data bases available in the Manpower and Personnel Research Division (MPRD). In addition, information is provided on the catalog description, contents, and use.

RN 93-09 Improving the Selection, Classification, and Utilization of Army Enlisted Personnel: Annual Report, 1987 Fiscal Year - Supplement to ARI Technical Report TR 862, Human Resources Research Organization; American Institutes for Research; Personnel Decisions Re-

search Institute; U.S. Army Research Institute. November 1992. (AD A261 035) The materials presented in this report were prepared under Project A, the U.S. Army's large-scale manpower and personnel effort for improving the selection, classification, and utilization of Army enlisted personnel. This Research Note supplements the U.S. Army Research Institute for the Behavioral and Social Sciences' Technical Report 862, the project annual report for the 1987 fiscal year. It augments that report by providing copies of a set of technical papers prepared during the year to report on detailed phases of the project research methods and results.

RN 93-10 Tacit Social Knowledge Acquisition as a Function of General Intelligence, and the Ability to Learn and Utilize Uncertain Social Feedback and Contingencies, Legree, P.J.; Busciglio, H.H. December 1992. (AD A260 290) Current research and theories of intelligence support the existence of a social or practical intelligence. The authors of this report adopt components of the triarchic theory of social and practical intelligence and view the ability to acquire tacit social knowledge as a function of general intelligence, the ability to perceive and learn subtle social information and contingencies, and the ability to accurately interpret and combine this information. This theory raises several counterintuitive predictions that are discussed in the report.

RN 93-11 The Joint Readiness Training Center's Training and Evaluation Outline Data Base: Preliminary Assessment, Fober, G.W. January 1993. (AD A260 157) The purpose of this research was to determine the usefulness of Training and Evaluation Outline (T&EO) data from unit rotations at the Joint Readiness Training Center (JRTC) as a means of determining unit performance. Infantry platoons and companies from five unit rotations were examined.

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Analyses included performance comparisons of both platoons and companies and a detailed examination of four selected tasks. Unexpected patterns in the data raised questions about the accuracy of the ratings (e.g., possible rater bias). Several critical errors in the data base were also discovered. These errors make the data unsuitable for use in determining training focus. The author concluded that changes in the data base are needed before it can be used to document unit performance. Through joint efforts by researchers and observer/controllers, the data collection effort could be improved. Additionally, followup efforts must take place to reduce possible rater biases and to ensure data entry quality control.

RN 93-12 Attention Factors Associated with Head-up Display and Helmet Mounted Display Systems, Morey, J.C.; Simon, R. January 1993. (AD A260 204) This report is a review of human attention research literature relevant to head-up display (HUD) and helmet-mounted display (HMD) systems in use or under development for rotary-wing aircraft. The fundamental attentional issue for HUDs and HMDs is division of attention between the outside-the-window scene and the displayed symbology. Selective attention applies more to elements within the HUD or HMD symbology. The review identified a number of areas for further research. These are (a) effects of dichoptic viewing, (b) eye dominance, (c) identification of strategies for effective time-sharing, (d) HUD and HMD training, and (e) pilot selection.

RN 93-13 Combat Leaders' Guide Updated: The Leader Handbook, Salter, M.S. February 1993. (AD A263 479) The Combat Leaders' Guide (CLG) is a job performance aid for leaders to use during periods of high stress and fatigue in continuous combat or realistic combat training. The pocket-

sized handbook contains information from soldiers' manuals and other training materials in easy-to-read checklist format. It is made of waterproof and tear-resistant paper and is fastened with rings that permit insertion or deletion of material. The handbook offers easy information retrieval, can be personalized to individual and unit needs, and can be used under low light and in inclement weather. A prototype CLG was printed as a test item in 1986; a second edition was printed in 1987 and reprinted in 1990. Based on CLG requests from units deploying to Operation Desert Shield/Desert Storm, the CLG was revised. User feedback on content and research, which led to a revised CLG entitled Combat Leaders' Guide: Leader Handbook, is described in this report. The CLG is a generic guide and requires little updating. It has shown its usefulness in supporting unit readiness by providing a leader with doctrinal, tactical, and technical materials in a quick-reference format.

RN 93-14 Sociocultural Designs for the Future Army: Workshop Proceedings, Segal, D.R. March 1993.

(AD B173 377) In this Research Note, conceptualizations of change in military organization are presented to aid in understanding the decline of the mass armed force during the Cold War period and in anticipating the nature of the post-Cold War Army. In the context of a theory of history in which past trends and cycles continue and yet changes are made on the basis of the lessons of the past, Moskos' thesis of a shift from an institutional to an occupational military and his developmental construct of a post-modern Army are used to specify how global factors such as technological change, the collapse of the Soviet Union, economic crisis, and the ongoing citizenship revolution affect threat perceptions, attitudes about the military, support for defense spending and specification of national priorities in America. The effects of these global and societal factors on military missions, force struc-

ture, and professional roles, as well as on issues of social diversity in the Army are discussed. Areas are identified in which proactive policy initiatives will help develop a small, flexible, and adaptable Army suitable to the range and ambiguity of military missions in the post-Cold War era.

RN 93-15 Twenty-First Instruction: On-Site Training, Yates, J.K. May 1993. (AD B174 874) This Research Note discusses computer-based instruction, computer-mediated conferencing, asynchronous computer conferencing, satellite instruction, and cognitive levels. Recommendations are made for development of authorware. Some existing computer-based instruction and expert system packages are correlated to cognitive levels. The field of artificial intelligence has contributed natural language interfaces. New applications for neural nets are being found at a rapid rate and should be more thoroughly investigated for computer-based instruction applications.

RN 93-16 Development Efficiency and Effectiveness of Alternative Platforms for Intelligent Tutoring for the Mobile Subscriber Remote Ratio-Telephone Terminal, Orey, M.; Trent, A.; Young, J. May 1993. (AD B174 762L) This project examined the efficacy of building intelligent computer-assisted training using an off-the-shelf hypermedia package. In addition, we compared this package to an architecture developed in a previous contract that was based in the C programming language. One person developed a tutor in Linkway (an off-the-shelf hypermedia system) and another developed the same tutor using the ALM C-based architecture. Development times, development functionality, ease of use, learner preferences, learner opinions, and learning effectiveness were compared. In all cases, the off-the-shelf package was shown to be superior to the C-based system.

RN 93-17 Comparative Military Personnel Policies, Harris-Jenkins, G. June 1993. (AD B154 547) This report looks at the problems associated with the recruitment and employment of military personnel in Western industrialized society. It is particularly concerned with issues relating to the recruitment and retention within the military of homosexuals, that is, those individuals who have a sexual propensity for persons of their own gender. After reviewing the legal definitions of homosexuality, homosexual acts and homosexual offences, the report concentrates on issues of policies, practices and problems. These are analysed in the context of seven cases studies (Belgium, France, Germany, Italy, the Netherlands, Scandinavia and the United Kingdom).

RN 93-18 Preliminary Validation of the Task Analysis/Workload Methodology, Hamilton, D.B.; Cross, K.D. June 1993. (AD A267 514) Over the past 8 years, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has sponsored the development of the Task Analysis/Workload (TAWL) methodology. The methodology is used to develop computer-based models that predict the operator workload of Army weapon systems. The TAWL methodology has been used to predict operator workload in existing and modified versions of the AH-64, UH-60, and CH-47 aircraft. This preliminary research was designed to assess the validity of the methodology. Seven experimental task conditions, analogous to rotorcraft operation and designed to vary in workload, were used in the research. Two TAWL workload prediction models of the conditions were independently developed by two analysts. Twenty AH-64A aviators performed repeated trials in each of the task conditions. Measures of the aviators' task performance, subjective workload, and physiological workload were obtained as TAWL model validity criteria. Although there were some differences

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between the models developed by the two analysts, the predictions generated by the models were highly correlated. In addition, the correlations between the average TAWL predictions for both models and the criterion measures were significant and high (between .89 and .99). The results support the validity of the TAWL methodology.

RN 93-19 Visual Display Principles for C3I System Tasks, Howell, W.C.; Lane, D.M.; Laux, L.F.; Anderson, L.A.; Holden, K.L. June 1993. (AD A267 969) Modern C3I systems are best described as semi-automated data management and decision systems over which human operators exercise supervisory control. The effectiveness of such systems is heavily dependent on the design for human-computer interaction (HCI), an important aspect of which is the visual display interface. Current Department of Defense policy mandates consideration of such human factors issues at an early stage in the design process. Comprehensive guidelines are available for display design applications after the general system parameters have been specified. Some recommendations are general, others are specific. This report offers a set of design principles at an intermediate (conceptual) level of abstraction as a complement to existing guidelines. The purpose is to synthesize current knowledge of human cognition into a form that will be applicable to the earliest stages of display design ("cognitive" functions being the most salient and critical of those remaining for the operator in advanced C3I systems). The principles are derived from a review of the literatures on human cognition, HCI, and display design some original research, and liberal interpretation by the authors. They are organized according to operations performed on specific categories of information in possible C3I task configurations.

RN 93-20 1991/92 Survey of Total Army Military Personnel: Taxonomy

of Written Comments, Braverman, E.P. August 1993. (AD A269 404) The development of a coding scheme for an open-ended response question that appeared in the 1991/1992 Surveys of Total Army Military Personnel (STAMP) is reported in this Research Note. The STAMP surveys were designed to provide information to assist personnel officials in setting policies and procedures for demobilization/redeployment and downsizing. A total of 6,287 comments were code. A hierarchical taxonomy was developed based on three sources of information. The primary source of information was the body of items comprising the STAMP surveys. The second source was a random sample of 69 actual survey responses. These comments were examined for any non-redundant information that might be used in the taxonomy. Finally, the Army Leadership Framework Matrix was examined and additional dimensions were derived for inclusion in the taxonomy. This taxonomy contained nine primary content categories: (1) Quality of Army Life, (2) Family/Relationship Issues, (3) Leadership, (4) Job Satisfaction, (5) Mobilization/Deployment/Demobilization, (6) Training, (7) Career, (8) Policy Issues, and (9) Miscellaneous.

RN 93-21, A-D Longitudinal Research on Officer Careers: Codebooks Vols 2, 3, 4, 5, Harris, B.C.; Woehner, K.; Schwartz, J.P.; Parham, L. September 1993. (RN 93-21A—AD A270 942; RN 93-21B—AD A270 889; RN 93-21C—AD A271 680; RN 93-21D—AD A271 103) The technical manual (Volume 1) and the codebooks published as Volumes 2 to 5 provide information on the Longitudinal Research on Officer Careers (LROC) Survey conducted annually from 1988 through 1992. Approximately 5,000 company-grade officers commissioned from 1980 through 1990 responded to each survey; a total of 928 officers responded to all four surveys. The technical manual provides the sampling plan and tables on the population, sam-

ple, respondents, and response rates, as well as a description of the survey and databases. The codebooks provide descriptive statistics for each question in the survey, the survey booklet, and a cross-reference of questions across the 4 years. The technical manual is Research Product 93-10, Longitudinal Research on Officer Careers: Volume 1. Technical Manual for 1988-1992 Surveys. In addition to this volume, codebooks are as follows: Research Note 93-21B, Longitudinal Research on Officer Careers: Volume 3. Codebook for the 1989 Survey; Research Note 93-21C, Longitudinal Research on Officer Careers: Volume 4. Codebook for the 1990 Survey; and Research Note 93-21D, Longitudinal Research on Officer Careers: Volume 5. Codebook for the 1992 Survey.

RN 93-22 Foundations for Measuring the Development and Emergence of Leadership Behavior, Lau, A.; Atwater, L.; Avolio, B.; Brass, B. September 1993. (AD A273 108) This Research Note describes the models and methods developed for research on developing leadership behavior and effectiveness. An overall framework for longitudinal research on the leadership development process is presented and steps taken to develop construct valid measures of a full range of leadership behaviors are described. Of particular relevance are (1) a model that goes beyond earlier taxonomies of leadership and includes transformation and transactional leadership; (2) a critical incident methodology and categorization scheme for qualitatively assessing leadership behavior; and (3) a behavior observation methodology for recording incidents of leadership across performance settings. These foundations are being applied in research on the emergence and development of leadership in a group of students attending an all-male military college.

RN 94-01 Compatibility Evaluation and Research on the Computerized Adaptive Screening Test Final Report:

User and Programmer's Guide, Park, R.K.; Dunn, M.L. October 1993. (AD A273 112) The Computerized Adaptive Screening Test (CAST) is used for predicting performance on the Armed Forces Qualification Test (AFQT). The goal of this project is to ensure CAST compatibility with the Electronic Information Delivery System (EIDS) now being fielded by the U.S. Army Recruiting Command. A number of software enhancements were implemented. Improvements were made in test item selection, reporting capability, experimental item selection, data storage capability, and software coordination. This report is a guide for users and programmers.

RN 94-02 The 1990 Army Career Satisfaction Survey (Commissioned Officer Form) Codebook, Jolicoeur, L.; Elig, T. October 1993. (AD A270 957) The Chief of Staff, Army (CSA) directed that ARI conduct the 1990 Army Career Satisfaction Survey (ACSS) to provide an overview of soldiers' attitudes, perceptions, and intentions concerning Army downsizing. Thirty thousand soldiers were surveyed in June and July 1990. The main sample of 28,071 represents soldiers at all ranks countable toward the active strength of the Army on 31 March 1990, with the following exclusions: a) general officers, b) soldiers with less than 12 months of service, and c) soldiers in the process of separation or retirement. Another 1,929 soldiers who had been surveyed in previous efforts were also sent this survey in order surveys and prepared the survey data set documented in this 1990 ACSS (Commissioned Officer Form) Codebook to ARI specifications. Companion volumes are also in preparation for the Warrant Officer Form and the Enlisted Form. See the 1990 Army Career Satisfaction Survey special report (Elig & Martell, 1990) for further details on the survey.

RN 94-03 The 1990 Army Career Satisfaction Survey (Warrant Officer

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Form) Codebook, Jolicoeur, L.; Elig, T. October 1993. (AD A270 957) The Chief of Staff, Army (CSA) directed that ARI conduct the 1990 Army Career Satisfaction Survey (ACSS) to provide an overview of soldiers' attitudes, perceptions, and intentions concerning Army downsizing. Thirty thousand soldiers were surveyed in June and July 1990. The main sample of 28,071 represents soldiers at all ranks countable toward the active strength of the Army on 31 March 1990, with the following exclusions: a) general officers, b) soldiers with less than 12 months of service, and c) soldiers in the process of separation or retirement. Another 1,929 soldiers who had been surveyed in previous efforts were also sent this survey in order to measure attitude changes over the last 4 years. The response rate adjusted for postal non-delivery and late returns of completed surveys is 65% (80% of warrant officers, 76% of commissioned officers, and 51% of enlisted). The overall margin of error is less than 1.3%. Data Recognition Corp. assisted in administering the surveys and prepared the survey data set documented in this 1990 ACSS (Warrant Officer Form) Codebook to ARI specifications. Companion volumes are also in preparation for the Commissioned Officer Form and the Enlisted Form. See the 1990 Army Career Satisfaction Survey special report (Elig & Martell, 1990) for further details on the survey.

RN 94-04 Update of the U.S. Army Research Institute's Officer Longitudinal Research Data Base, Ramsey, L.J.; Fertig, K.L.; Younkman, D.D. October 1993. (AD A275 168) This document describes the procedures performed to augment the Officer Longitudinal Research Data Base (OLRDB) with 1991 data. The OLRDB is organized as six data sets, consisting of personnel, pre- and post-commissioning training, and field performance data for Army officers. The OLRDB data sources include the Officer Master File (OMF), the Separation Officer

Master File (SOMF), Automated Instructional Management System (AIMS), the U.S. Military Academy (USMA) Cadet File, Army ROTC Commissioning files, and Army ROTC Advanced Camp files.

RN 94-05 Canceled.

RN 94-06 The Influence of Uncertainty and Time Stress on Decision Making, Leddo, J.; Chinnis, J.O., Jr.; Cohen, M.S.; Marvin, F.F. October 1993. (AD A273 335) This project studies the effects of uncertainty-and time stress on the decision making of experienced Army officers playing the role of a division operations officer analyzing courses of action in a tactical scenario. Thirteen lieutenant colonels (LTC) were presented with a defensive scenario (a Fulda Gap scenario) and asked to analyze three courses of action and make a final recommendation. After being given time to familiarize themselves with the scenario, seven of the participants were given 45 minutes for their analyses (time-stress condition), after which participants made their final recommendations. Data were collected on the information participants used to perform their analyses. No-stress participants compared with time-stress ones spent more time on information that was relevant to resolving uncertainty and providing a "big picture" of their mission, used more analysis methods to arrive at a recommendation, and tended to recommend less conservative courses of action. These results suggest that under conditions of uncertainty and time stress, aiding concepts are needed that supplement the breadth of analysis and deliver information more efficiently so that decision makers will be able to use all relevant information.

RN 94-07 Software User's Manual for the Special Forces Military Occupational Specialties Allocation System, Li, F.; Do, K.; Goiocochea, A. October 1993. (AD A273 285) This document describes the

Special Forces (SF) Military Occupational Specialties (MOS) Allocation System and provides instructions for using and updating it. This computer software system enables a novice computer user to utilize the SF MOS Allocation model designed to aid in the allocation of soldiers to SF qualification courses. The objective of the model is to make assignments that maximize the probability of soldiers passing the course and, at the same time, to satisfy organizational constraints.

RN 94-08 The Training of the Battalion Staff Intelligence Officer: A Descriptive Analysis and Sample Program, Getting, J.P. November 1993. (AD A278 156) This report summarizes deficiencies in battalion staff functional area training and, using the intelligence officer (S2) as an example, provides guidelines for improving the skills required by the S2 to function effectively in the maneuver battalion. A prototype distributed training module for the battalion S2 is presented. This prototype module could form the basis for other staff modules for battalion staff officers that will contain both computer-based instruction and asynchronous computer conferencing.

RN 94-09 Predicting Table VIII Tank Gunnery Scores from a Test of GUARDFIST I Proficiency and Training Matrix Advancement, Smith, M.D.; Hagan, J.D. November 1993. (AD A278 044) This report describes two investigations of the relationship between performance on the Guard Unit Armory Device Full-Crew Interactive Simulation Trainer—Armor (GUARDFIST I) and live-fire tank gunnery performance. In the first investigation, 19 Army National Guard (ARNG) M1 tank crews completed a GUARDFIST I-based test of gunnery proficiency and then fired tank gunnery Table VIII during annual training. Results showed that crew performance on the GUARDFIST I test was unrelated to performance on Table

VIII. The second investigation examined the relationship between aggregate measures of GUARDFIST I training (maximum training matrix advancement and total training time) and Table VIII scores collected 6 months later on eight ARNG M1 tank crews. Results showed that total training time was unrelated to Table VIII scores, but that maximum training matrix advancement was strongly predictive of subsequent Table VIII performance. Findings suggest that brief, one-shot tests of proficiency on GUARDFIST I have limited predictive utility, but that aggregate measures of gunnery proficiency on GUARDFIST I can be used to predict live-fire tank gunnery performance. A larger sample size is needed to substantiate the validity of this predictive relationship.

RN 94-10 Building and Retaining the Career Force: New Procedures for Accessing and Assigning Army Enlisted Personnel Annual Report 1991 Fiscal Year, Campbell, J.P.; Zook, L.M. March 1994. (AD A278 726) The Career Force research project is the second phase of a two-phase Army program to develop a selection and classification system for enlisted personnel based on expected future performance. In the first phase, Project A, a large and versatile data base, was collected from a representative sample of Military Occupational Specialties (MOS) and used to (a) validate the Armed Services Vocational Aptitude Battery (ASVAB) and (b) develop and validate new predictor and criterion measures representing the entire domain of potential measures. Building on this foundation, Career Force research will finish developing the selection/classification system and evaluate its effectiveness, with emphasis on assessing second-tour performance. This second year of the project emphasized building the data file for the Longitudinal Validation cohort, developing the basic scores for the final versions of the Experimental Predictor Battery and the first-tour

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performance measures, and carrying out the basic longitudinal validation.

RN 94-11 Young Single Soldiers and Relationships, Orthner, D.K.; Bowen, G.L.; Zimmerman, L.I.; Short, K.A. March 1994. (AD A279-167) This research examines the impact of boyfriend and girlfriend relationships on the readiness, retention, and support service needs of young single soldiers in the Army. It is the first major investigation in this area and offers military leaders a new look at the transitions soldiers make from single to married status and the effects of those transitions on behavior, attitudes, and needs. The data were collected from a random sample of 11,035 soldiers in 1989. The analyses were conducted on 2,242 single soldiers in the junior enlisted (Private—Sergeant) and officer (Second Lieutenant—Captain) grades under 30 years of age with no children. A sample of 1,017 young married soldiers with no children who reported they were happily married was examined using the same variables for comparison purposes. It was found that involvement in relationships had a significant effect on soldiers and that effects varied according to the seriousness of the relationship, the gender of the soldier, and the race/ethnic status of the soldier. There was an overall trend toward higher job performance and Army commitment among those in relationships, but this was less true for minority and female soldiers than for male soldiers. Expressed lack of community and relationship support were greatest among those soldiers who were considering marriage. The findings were interpreted in terms of their value to military service providers, trainers, leaders, and manpower personnel. Specific recommendations were offered to expand support program efforts to singles, offer more premarriage counseling and training on relationship issues, increase training on single-related issues to service providers and unit leaders, and

conduct further research on this military population.

RN 94-12 Young Single Soldiers and Relationships: Appendix with Crosstabulations, Orthner, D.K.; Bowen, G.L.; Zimmerman, L.I.; Short, K.A. March 1994. (AD A279-211) This research examines the impact of boyfriend and girlfriend relationships on the readiness, retention, and support service needs of young single soldiers in the Army. It is the first major investigation in this area and offers military leaders a new look at the transitions soldiers make from single to married status and the effects of those transitions on behavior, attitudes, and needs. The data were collected from a random sample of 11,035 soldiers in 1989. The analyses were conducted on 2,242 single soldiers in the junior enlisted (Private— Sergeant) and officer (Second Lieutenant—Captain) grades under 30 years of age with no children. A sample of 1,017 young married soldiers with no children who reported they were happily married was examined using the same variables for comparison purposes. It was found that involvement in relationships had a significant effect on soldiers and that effects varied according to the seriousness of the relationship, the gender of the soldier, and the race/ethnic status of the soldier. There was an overall trend toward higher job performance and Army commitment among those in relationships, but this was less true for minority and female soldiers than for male soldiers. Expressed lack of community and relationship support were greatest among those soldiers who were considering marriage. The findings were interpreted in terms of their value to military service providers, trainers, leaders, and manpower personnel. Specific recommendations were offered to expand support program efforts to singles, offer more premarriage counseling and training on relationship issues, increase training on single-related issues to service providers and unit leaders, and

conduct further research on this military population.

RN 94-13 Micro Computer Feedback Report for the Strategic Leader Development Inventory - Source Code, Hopkins, J.E. March 1994. (AD A279-174) In 1990, individuals at the U. S. Army War College (USAWC) saw the need for a tool to provide leadership developmental feedback to incoming students to help with planning for the resident year and progress following that year. The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) developed and pilot-tested the Strategic Leader Development Inventory (SLDI) to satisfy that need. As a part of the concept, an automated feedback printing program was developed to enable user organizations to print graphic feedback that facilitates student interpretation of SLDI scale scores. That program was developed for the academic year (AY) 91-92 pilot test and was revised for the academic year 92-93 field test of the SLDI. The AY92-93 version of the FeedBack program produced reports for a fixed set of questions and evaluation factors. If any changes were made in the SLDI, the program had to be rewritten. The AY93-94 upgraded version of the FeedBack program is flexible. It allows the survey questions and the evaluation factors to be redefined through the use of a look-up table, thereby enabling continuous user product improvement over time, and adaptation of the SLDI to different subject populations, as needed. This report contains the source code for the FeedBack program. A user's guide, *Micro Computer Feedback Program for the Strategic Leader Development Inventory: User's Guide*, has been published separately.

RN 94-14 Seminar Training for Command Groups, Keene, S.D. March 1994. (AD A280 258) The Seminar approach to training has been growing in popularity in the Army training community as

a result of the success of the Battle Command Training Program (BCTP). In April 1992 the U.S. Army Combined Arms Command—Training requested that the Fort Leavenworth Field Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences conduct a project with the following goals:

1. Using the Battle Command Training Program (BCTP) Seminar as a model, evaluate the effect of seminars on subsequent performance on a command post training exercise (CPX),
2. Define a suitable format for a seminar as part of a command post training strategy for each echelon of command.

This paper describes the BCTP model and presents findings and recommendations concerning the stated goals.

RN 94-15 Interview Data Collection for Identification of Potential Combat Effectiveness Variables, White, R.A. March 1994. (AD A280-258) This report presents preliminary results from interviews with soldiers participating in field exercises in Kuwait. This report sets forth observations and interpretations from the collected interviews that may have implications for personnel, training, and other Army systems. The results, combined with previous collection efforts, should provide a sampling of combat effectiveness variables that will assist in determining if combat performance can be predicted during the initial selection process.

RN 94-16 Principles of Design for High Performing Organizations: A Suggested Research Program. Appendixes., Osborn, R.N. March 1994. (AD A278 634) This is the second report in a series of three to identify useful directions for future research on military organization design. The first established a baseline of what is known from the published literature. This report focuses on the areas that are "cutting edge," as identified by established and emerging schol-

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ars in this field. It provides in an extensive appendix the outline of research projects , that, if conducted, would probably lead to a new technology of design for high performance organizations. It is based on a model that integrates consideration of the environment, the systems context, the structure, and emergent systems (leadership, learning, culture, and innovation, among others). Causal mechanisms include rationality, power/control dynamics, institutional processes, and individual enhancement needs. Six broad research areas are (1) design of high performing organizations in turbulent settings, (2) designs to implement strategy, (3) design robustness under changing systems contexts, (4) accommodation of apparently conflicting desired outcomes, (5) emergent systems, and (6) the effect of interpretations of design. The report makes a good case for the importance of accelerating research on organizations, given the increasingly significant impact of information technology and globalization on organization performance requirements, both public and private.

RN 94-17 Report on Survey Implementation, Research Triangle In; Caliber Associates; HumRRO. March 1994. (AD A278 729) This report describes the development and implementation of the Army Family Research Program (AFRP) survey of soldiers and spouses conducted in 1989-1990. Survey data were collected from an Army-wide probability sample of soldiers and spouses. Data were provided by 11,035 soldiers and 3,277 spouses from 528 active component Army units at 34 geographical locations in the United States and overseas. The survey collected data on soldier and spouse background, the unit environment, soldier and spouse work, relationship and commitment to the Army, Army and career plans, spouse and family, children and child care, community, and programs and services. Data from the survey have been used in analyses of soldier retention, soldier and unit readiness, relocation

adjustment, unit demands, family separation, Army community support, young single soldiers, Army family patterns, and other topics. This report describes the survey design and methodological development, sampling, instrument development, data collection, and data entry. Questionnaires and other materials are included as appendixes.

RN 94-18 Suggestions for After Action Review Facilitators, Keene, S.D. April 1994. (AD A280 346)

The After Action Review (AAR) provides performance feedback to participants in Army training events. The AAR is defined in FM 25-100 as "a method of providing feedback to units by involving participants in the training diagnostic process in order to increase and reinforce learning." This paper discusses the AAR in the context of a computer-driven command post training event and specifically addresses the following questions:

Who should attend the AAR?

What should the AAR contain?

What should be the frequency of the AARs in a command post exercise?

How should the AAR be compiled and presented?

Should the AAR use preformatted products or templates?

Should the content of the AAR be event type presentations or process type presentations or both?

Should the AAR be multi-echelon or single echelon?

Should the AAR focus on a single battlefield operating system (BOS) or multiple BOSs?.

RN 94-19 Research Directions for Humans in Control of Automated Air Defense Command and Control Systems, Hawley, J.K. June 1994. (AD A282 832) This report describes work performed during the second year of the project titled "Command and Control Decision Making Requirements During Engagement Operations."

The work involves the development of a human performance and training testbed for automated air defense command and control. The testbed is a flexible simulation capability for the study of issues involving human performance and training in a complex supervisory control setting. The first portion of the report addresses the testbed's objectives and integration concept. Next, the report outlines a concept for human supervisory control of a complex, automated process control environment. This concept is referred to as intelligent rule-based supervisory control, or IRBSC. IRBSC involves cooperative control of a real-time process by human operators and an expert system embedded in the command and control computer. Finally, the report outlines a research agenda for using the testbed to explore human performance, training, and performance support issues for real-time command and control systems.

RN 94-20 Models of Soldier Retention,

Rakoff, S.H.; Griffith, J.D.; Zarkin, G.A. June 1994. (AD A282 670) This report examines the impact of Army work, community, family, and individual factors on young soldiers' reenlistment intentions and outcomes. The data used in the report were collected in an Army-wide survey of a probability sample of soldiers and spouses conducted in 1989-1990. Retention intentions are examined for male soldiers in the ranks of private through staff sergeant for whom supervisor ratings of performance were available in the survey ($n=5,299$). Actual retention outcomes are examined for soldiers whose service obligation ended between the time of the survey and June 1990 ($n=1,537$). The report examined factors affecting two outcomes:

- Young soldiers' intentions to reenlist at the end of their service obligation. This was examined separately for soldiers classified as high, intermediate, and low in terms of their supervisors' ratings of their readiness and performance, to examine the factors

that contribute most to the retention of high-quality young soldiers.

- Actual retention outcomes (whether still in the Army) as of June 1990, prior to the beginning of Operation Desert Shield/Desert Storm and to the major period of downsizing.

Logistic regression models are used to examine the effects of different factors on these research outcomes. Factors associated with high retention intentions for high-performing young soldiers include

- Favorable Army opportunities, compared with civilian alternatives, for career advancement, service to the country, and excitement and adventure.
- A favorable climate for family life—quality of place for children and spouse job/career opportunities—compared with civilian life.

A favorable perception of Army jobs compared with civilian jobs on material benefits (pay, retirement benefits, job security), along with opportunities for advancement, was important for soldiers at lower performance levels. Retention intentions are strong predictors of actual retention behavior. In addition, controlling for retention intentions, soldiers with a longer period between the time intentions are measured and actual reenlistment decisions appear more likely to remain in the Army.

RN 94-21 African American Women Who Served Overseas During World War II: Towards A Lifecourse Analysis,

Moore, B.L. June 1994. (AD A282 919)

This report documents the preliminary findings of a research effort to collect data on African American women who served in England and France during World War II. The objective of the study was to lay the groundwork for a study that would subsequently be developed into a life-course analysis. During the summer of 1992, archival documents of the Women's Army Auxiliary Corps were collected and examined and some former members of the Six-

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Triple Eight Central Postal Directory Battalion were located and interviewed about their experiences before, during, and after military service. Discussed in the report are a) the circumstances under which the Battalion was established, b) demographic characteristics of women who served in the unit, c) motives, incentives, and key influences of the women for joining the Women's Army Auxiliary Corps, and d) ways of expanding upon the initial study to incorporate a life-course analysis.

RN 94-22 The Development of Performance Evaluation Scales for First-Level Army Civilian Supervisors, Sadacca, R.; Kralj, M.M.; Rosenthal, D.; Stawarski, C.; Rigby, C.K. July 1994. (AD A282 454) The Civilian Leadership Research Program was established in 1987 to improve the leadership of Army civilian personnel. A major component of the research was the development of a set of supervisory selection measures, including a scoreable inbasket exercise, a biographical data instrument, and an instrument for measuring temperament. This report describes the development of a set of supervisory rating scales that will be used to provide criteria against which the selection instruments will be validated. The critical incident approach was used to determine both the performance categories for which scales would be developed and the behavioral anchors that would be used in the scales. A total of 93 first- and second-level supervisors who attended seven critical incident workshops produced 841 incidents. The incidents were categorized by the researchers and then used in a series of retranslation workshops with different groups of supervisors. A total of 13 trial scales emerged from this process and later reviews of the scales. The scales were administered to first- and second-level supervisors of 53 Army civilian supervisors. Analyses of the obtained rating data suggested that a composite score based on the average of the 13 scale

ratings would be highly reliable and could be used to validate selection instruments.

RN 94-23 FY88 Biennial Survey of Army Civilians: Formation of Item Composites and Investigation of Broad Demographic Trends, Sadacca, R.; Jones, K.N.; DiFazio, A.S.; Rigby, C.K.; Kilcullen, R.N. July 1994. (AD A283 364) The Civilian Leadership Research Program was established in 1987 to improve the leadership of Army civilian personnel. A major component of the research was the development of baseline measures of organizational and personnel factors through which the effectiveness of personnel initiatives could be evaluated. This report describes the analyses conducted on responses of a sample of about 9,000 Army civilians to the FY 1988 Army-wide biennial survey. Through factor and item analyses of the survey questions, a number of more comprehensive and reliable measures were formed by combining responses from two or more questions. In the process, items that were essentially redundant or difficult to interpret were identified for possible deletion in future surveys. In addition, differences among various types of employees in the patterns of their baseline measures and responses to the individual questionnaire items were identified. For example, in general, male personnel responded more favorably to the questionnaire items than did females, younger personnel had lower levels of job satisfaction, and more educated employees expressed more willingness to leave their jobs.

RN 94-24 Military-Civilian Working Relationships, Stawarski, C.A.; Smith, D.A.; Kilcullen, R.N.; Rigby, C.K. July 1994. (AD A283 538) Because civilian and military personnel often must function as one unit, positive military/civilian working relationships are critical to the successful functioning of the Army. The primary purpose of this report is to analyze some of the differ-

ences between civilians who have civilian supervisors and civilians who have military supervisors. Data from FY88 Biennial Surveys of Army Civilians are used to focus analyses on attitudes regarding evaluations of supervisors, perceived supervisor support for training, knowledge and use of performance appraisal procedures, cooperation and efficiency of work groups, the perception of civilians' importance to management, and general satisfaction. A two-stage data analysis process is used. Analyses of variance are performed to focus on promising dependent variables. The significant results are followed up with regression analyses to control for unwanted sources of variation and to determine the magnitude of the effects of interest. The results should be interpreted with caution. Although the majority of the regression analyses obtain results that are statistically significant, the percent of variance explained is negligible and therefore not meaningful in an operations sense.

RN 94-25 The Effect of Response Format on Reliability Estimates for Tacit Knowledge Scales, Legree, P.J. July 1994. (AD A283 547) Most aptitude scales adopt a Forced Choice response format in which answers are scored as either correct or incorrect. Such a scoring procedure is consistent with the nature of the knowledge underlying these aptitude scales because the relevant knowledge domains can usually be used to either support or contradict a specific supposition. Assessing performance with tacit knowledge scales that lack an academic knowledge base often requires the opinions of subject matter experts and responses cannot always be unambiguously scored. Data indicate that an improvement in the reliability of a Tacit Knowledge Scale could be realized by substituting a Likert response format in place of a traditional Forced Choice format; this finding demonstrates the power of the Likert response format to measure individual differences in an uncertain knowledge domain. This

research was conducted in support of the development and validation of a Social Intelligence scale.

RN 94-26 Executive Leadership: Requisite Skills and Developmental Processes for the U.S. Army's Civilian Executives, Markessini, J.; Lucas, K.W.; Chandler, N.; Jacobs, T.O. July 1994. (AD A284 127) In 1985 and 1986, an extensive data base was assembled from interviews of Three- and Four-Star Army General Officers. In 1989 and 1990, the interviews were supplemented with interviews of One- and Two-Star General Officers. Those interviews were subjected to extensive content analysis to identify critical task performance requirements and skills, knowledges, abilities, and other attributes needed to effectively perform those tasks. The results of analyses of these interviews have been published elsewhere. This report details parallel analysis of interviews with 27 civilian members of the Executive Service (ES) and Senior Executive Services (SES). General findings were that members of the SES reported similar task performance requirements and the need for similar skills and abilities as their General Officer counterparts. Nearly half of the sample was performing duties judged to be strategic in scope and scale. However, there were indications that the potential of some members of the SES exceeded their duty position requirements, i.e., they were not being fully challenged by the complexity and responsibility inherent in their jobs.

RN 94-27 Building and Retaining the Career Force: New Procedures for Accessing and Assigning Army Enlisted Personnel - Annual Report 1992 Fiscal Year, Campbell, J.P.; Zook, L.M. July 1994. (AD B188 259) The Career Force research project is the second phase of an Army program to develop a selection and classification system for enlisted personnel based on expected future performance. In the first phase,

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Project A, a large and versatile data base was collected from a representative sample of Military Occupational Specialties (MOS) and used to (a) validate the Armed Services Vocational Aptitude Battery (ASVAB) and (b) develop and validate new predictor and criterion measures representing the entire domain of potential measures. Building on this foundation, Career Force research is finishing development of the selection/classification system and evaluating its effectiveness, with emphasis on assessing second-tour performance. This third year of the project completed data collection from the Longitudinal Validation cohort, conducted analyses of test results from the second-tour sample, and expanded development of a model of second-tour noncommissioned officer performance. Analyses of the test results are continuing.

RN 94-28 Executive Leadership: Requisite Skills and Developmental Processes for Three- and Four-Star Assignments,

Harris, P.; Lucas, K.W. August 1994. (AD A285 499) This report describes the investigation of work and skill requirements for three- and four-star general officers. Researchers conducted structured interviews and performed a content analysis to describe the nature of three- and four-star assignments, career paths, and developmental patterns. Requisite skills included consensus building, envisioning, climate setting, self-evaluating, sharing frames of reference, risk taking, and dealing with uncertainty. Implications for executive development are described in terms of level-specific organizational and individual requirements.

RN 94-29 Strategies for Augmentation Initiatives for Leadership Self-Development Program,

Bryant, C.D. August 1994. (AD A285307) Perhaps too much is being asked of the self-development pillar of the Army leadership system in view of current technological and social change. Some aug-

mentation and enhancement efforts are indicated. A variety of such initiatives are proposed in this report, including the use of recorded books, condensed books, special reading agendas, and the inauguration of a journal that would serve as a guidance mechanism for more productive self-education reading programs. Some new directions in leadership self-development are also proposed. Among these are reconceptualizing leadership as conventional behavior and task mastery that can be operationalized at an everyday level of accomplishment. If leadership can be viewed as a social role, then it can be used as a socialization mechanism. This process is best accomplished by mastering a series of increasingly complex skills and successfully integrating them. A structured, self-motivating competence delivery system to master such skills is proposed, as are several training exercises that enhance teamwork and promote leadership.

RN 94-30 The Officer's Advance Course: Prior Experience Survey,

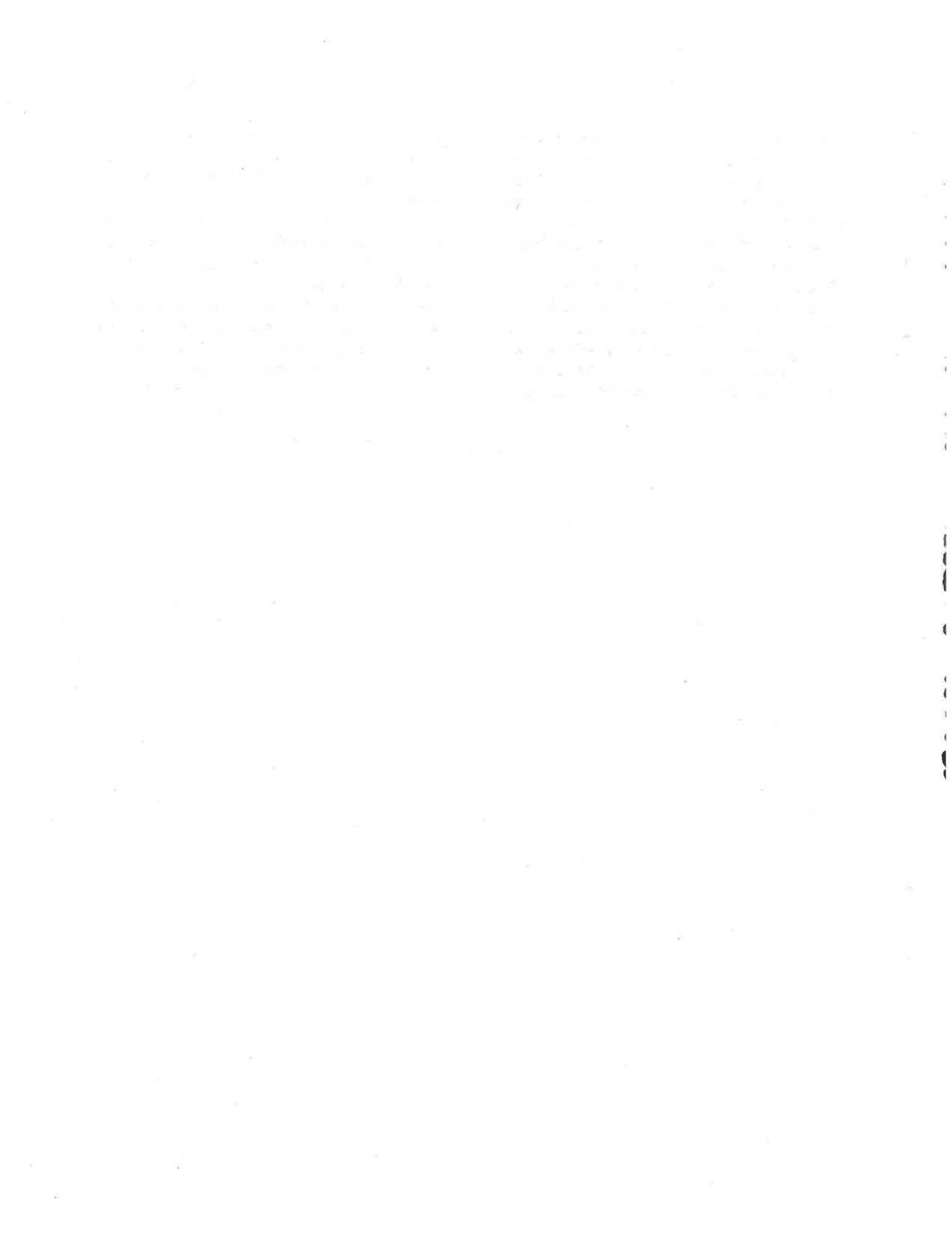
Salter, M.S. August 1994. (AD A285 306) Personnel in infantry units have observed that battalion staffs have difficulty achieving staff synchronization. Research suggests that part of the problem is that frequently staff officers are placed in staff positions without sufficient training. This report presents results of six Officer Advance Course surveys in which officers were asked to describe their background experiences and any training they had prior to assuming staff positions. Both active and reserve component personnel were surveyed.

RN 94-31 First-Level Supervisors Job Analysis Follow-Up: Identification of KSAO-Task Linkages,

Ziemak, J.P.; Rigby, C.K.; Dugan, B.A. August 1994. (AD A285 487) In 1986 the U.S. Army began the Professional Development of Supervisors Study (PDS2) to determine the best approaches for selecting and developing civilian

first-level supervisors. An extensive job analysis, the foundation for the construction of selection instruments, was part of PDS . This report describes the linkage of important tasks and knowledge, skills, abilities, and other characteristics (KSAOs) identified in that job analysis and the development of a test plan based on the linkages identified. The job analysis identified 226 tasks and 93 KSAOs. Because of the large number of judgments required to link all tasks with all KSAOs, the linkage was accomplished in two phases. In preparation for Phase I, the 226 tasks were

sorted into 22 task categories. Phase I judges linked KSAOs with the 22 task categories. In Phase II, judges linked the 58 KSAOs that survived Phase I with the remaining tasks. Sixteen knowledges and 30 ASOs remained after the Phase II data analysis, The ASOs were rationally grouped into twelve supervisory dimensions. A decision was made that the selection components that were best able to fulfill both technical and practical considerations for this testing environment were the in-basket exercise and structured interview.



Research Products

RP 90-01 Multipurpose Arcade Combat Simulator (MACS) Basic Rifle

Marksmanship (BRM) Program, Broom, J.M.; Champion, D.F.; Greene, W.H.; Martere, R.F.; Purvis, J.W.; Sills, E.G. October 1989. (AD A214 459) This document contains a description of the Basic Rifle Marksmanship (BRM) program of the Multipurpose Arcade Combat Simulator (MACS) system, along with a record of the measures taken, standards used, underlying instructional methodologies, a statement of the technical limitations of the system, and copies of programming flow charts. The information is for use by personnel who may be involved in future developmental work on the MACS system and for those who must demonstrate and explain the BRM program.

RP 90-02 ARI-NTC Archive and Research Center Workshop Notebook, Goehring, D.J. October 1989.

(AD A216 480) This product evolved from a series of 13 workshops jointly sponsored by the Combined Arms Training Activity/Center for Army Lessons Learned (CATA/CALL) and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and designed to exploit the National Training Center data archived at the U.S. Army Research Institute Field Unit at Monterey, CA, for identification of Army Lessons Learned and performance trends. More than 230 participants from the Army Schools, Army Commands, contractors, and other interested organizations have attended the workshops. The workshops are now conducted periodically on a quarterly basis and will continue for foreseeable future.

RP 90-03 Trainer's Guide: MACS Basic Rifle Marksmanship (M16 Rifle), Purvis, J.W.; Wiley, E.W. November 1989. (AD A217 593) The Multipurpose Arcade Combat Simulator (MACS) is a low-cost,

part-task weapons trainer that has been validated as a teaching device with entry-level soldiers. The system may be used for basic, preparatory, sustainment, and remedial training. The MACS system has four parts: An M16 demilitarized or replica rifle with a light pen attached to the barrel; a Commodore 64 computer; and a Basic Rifle Marksmanship (BRM) cartridge designed for use with the M16 rifle. Macs allows soldiers to practice marksmanship skills by firing at targets at scaled ranges displayed on a computer screen. Diagnostic feedback is provided on the screen. The Trainer's Guide is intended to accompany each MACS system. The Guide provides instructions for assembly of the system and for correct alignment of the light pen mount. Summary descriptions of each level of the program are provided along with descriptions of the feedback and standards at each level. In addition to the nine teaching levels, a sight and grouping program, designed to teach the basic skills of sight alignment and shot grouping to the novice marksman, is included. Other options include "call your shot" and incorporating the effects of wind of varying speeds and directions. The MACS system software is largely self-explanatory but assumes the presence of an instructor. Before using the MACS system as a teaching device with soldiers, the instructor should read the MACS Trainer's Guide and shoot the entire program several times to become familiar with the system.

RP 90-04 Development of the Enlisted Panel Research Data Base

Noznisky, A.; Ramsey, L.; Younkman, D.D. January 1990. (AD A219 865) A core data set of the Enlisted Panel Research Data Base (EPRDB) was constructed from annual data for 1974-1988. The data were transformed into consistent and reliable data variables for longitudinal analysis. The EPRDB contains both personal information and selected career

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history variables. It is comprised of two data sets: a 25 percent sample of accessions occurring in 1974-1984 and a 100 percent sample of accessions occurring in 1985-1988. The data sets are available in both character file and Statistical Analysis System (SAS) file format and are stored at the National Institutes of Health (NIH) computing facility.

RP 90-05 Design of a Joint Service Multipurpose Arcade Combat Simulator (JMACS), Evans, K.L.; Marshall, A.H.; Wolff, R.S.; Broom, J.M.; Greene, W.H. January 1990. (AD A221 133) This report documents the design of the hardware and software used in the Joint Service Multipurpose Arcade Combat Simulator (JMACS) project. The JMACS project was an outgrowth of the Multipurpose Arcade Combat Simulator (MACS), a patented part-task weapons trainer developed by the U.S. Army Research Institute for the Behavioral and Social Sciences to overcome the training problems encountered due to insufficient facilities, ammunition, and qualified instructors. A MACS system consists of a long-distance light pen mounted to a weapon or mock-up, a microcomputer, a video monitor, and a software cartridge. Following testing of prototype systems in the Army, the Navy and Air Force became interested in potential applications of MACS technology for weapons training programs. This interest led to initiation of the JMACS project, sponsored by the Joint Service Manpower and Training Development Program. The JMACS project funded the development of a long-distance light pen (patent pending) and light pen mount by the Naval Training Systems Center, introduced MACS technology to the Air Force and Navy in a series of field tests, and supported ongoing MACS development and evaluation in the Army.

RP 90-06 Exploratory Discussions of Spouse Employment Issues, Braddy, B.A. January 1990. (AD A219 902)

This research supports *The Army Family Action Plans (1984-1989)* by examining factors related to the employment problems of Army spouses. The research examines reasons for not working, barriers to employment, education and training needs, and perceived effects of spouse employment on readiness, retention, and family wellness. Group discussions were conducted with 152 (79 employed and 73 nonemployed) Army spouses and 30 Army program personnel located at 4 interview sites. One interview site was a U.S. Army Forces Command (FORSCOM) installation; one was a U.S. Army Training and Doctrine Command (TRADOC) installation; and two were U.S. Army-Europe (USAREUR) installations. A core set of questions was asked of both employed and nonemployed spouses. Employment-specific questions asked of employed spouses included employment status; satisfaction with employment status; reasons for working; possible barriers imposed by the lifestyle for obtaining and keeping a job; possible hindrances created by the Army lifestyle for career development; knowledge of available job search assistance sources; education and training needs; and perceptions of how spouse employment relates to soldier readiness and career decisions. For the nonemployed spouses questions focused on need/desire for employment; barriers to obtaining a job or pursuing a career; education and training needs; knowledge and use of available employment assistance programs; and perceptions of how not being employed affects soldier readiness and career decisions. Interviews with Army Program personnel included questions on problems that Army spouses experience in finding employment, types of work desired by spouses, skills possessed by spouses, training needs, and soldiers' attitudes toward spouse employment. Financial and personal reasons were the most frequently expressed responses for working or wanting to work. Personal reasons for wanting to work included personal satisfaction, the desire to get out of the house,

personal challenge, the need to see other adults (particularly when the soldier is away), and a desire to gain self-confidence and skills. Perceived barriers to spouse employment included lack of employment opportunities in both the civil service and private sectors, civil service procedures, difficulties in understanding and making use of the spouse preference program, reluctance of employers in the private sector to hire Army spouses because of reputed short job tenure, and impediments to career development, including limited job opportunities, frequent relocations, and limitations of Army lifestyle. Problems associated with the ability to pursue employment included, in addition to limited employment opportunities, factors such as availability and cost of childcare and lack of transportation. Spouse employment was viewed as having a positive effect on readiness and, in general, spouses reported that the soldier was happier and better able to perform military duties when the spouse was working. The effect of spouse employment on retention decisions was more ambiguous than it was for readiness. Most spouses indicated that the soldier's career would come first but there was some evidence in the interview material to suggest that there may be a shift to the spouse's career assuming increased importance. Specific education and training needs included computer and clerical skills training, better advanced educational opportunities, and expansion of the Civil Service intern program to include "portability" of internships from location to location.

RP 90-07 User's Manual for the Prototype Analyst Workstation

(PAWS), Thompson, D.; Rueter, H.; Rainaldi, W.; Orosz, J. February 1990. (AD A221 351) The Prototype Analyst Workstation (PAWS) is a personal-computer-based decision aid intelligence analysts can use to evaluate alternative enemy courses of action. It assists analysts in assigning weights to attributes and scoring al-

ternative enemy courses of action so that they can compute an overall evaluation of each course of action. PAWS also has a facility for Bayesian updating of probabilities over the courses of action as the analyst receives new intelligence information. This report is a manual for analysts who need to understand how to run PAWS to solve intelligence problems, computer system managers who need to understand how to configure PAWS and its associated files on a computer system, and for persons who need to develop new materials for use with PAWS (i.e., new text and graphics descriptions of problem scenarios and new hierarchies of factors for evaluating enemy courses of action).

RP 90-08 Course of Action Assessment Tool (COAAT) Functional Description, Ross, C.G. February 1990.

(AD A220 435) This report documents the software functions of the Course of Action Assessment Tool (COAAT). COAAT is a computerized aid for assisting tactical operations officers in the assessment of various courses of action (COA). COAAT assists the analyst in organizing critical events (CE) according to his chosen method for analyzing the battlefield, analyzing the detailed actions of each COA, and in summarizing and comparing the results so the preferred COA may be identified. COAAT was conceived and developed as a prototype for a field operating system. It is configured for operation in the laboratory environment of EDDIC (Experimental Development, Demonstration, and Integration Center) at the Army Research Institute Field Unit, Fort Leavenworth, KS. COAAT is written in Lisp and is operational on Symbolics 3675s and 3640s in the EDDIC facility. Although the current version of COAAT is not an artificial intelligence (AI) application, exercises using COAAT may reveal opportunities for the application of AI techniques.

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RP 90-09 VARWARS: A Group Problem

Solving Exercise, Lussier, J.W.

February 1990. (AD B143 860) VARWARS is a planning and problem solving exercise in which a small group plans for the employment of a hypothetical training device. The exercise stresses information sharing techniques and group decisionmaking processes. Solutions to VARWARS can be objectively and quantitatively scored. This manual provides the information necessary to administer, score, and interpret a VARWARS exercise.

RP 90-10A Task Analysis of the CH-47D Mission and Decision Rules for Developing a CH-47D Workload Prediction Model. Volume I: Summary Report, Bierbaum, C.R.; Aldrich, T.B.

February 1990. (AD A221 969) A mission scenario was used to conduct a comprehensive task analysis for CH-47D operations. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission. Nine phases, 37 segments, 66 functions, and 154 tasks were identified. The crewmember performing each task was identified and estimates of the sensory, cognitive, and psychomotor workload associated with the tasks were derived. Estimates of the task times were also derived. The mission/task/workload analysis data were used to develop a computer model of workload for CH-47D crewmembers. The models used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decisions rules were written to specify the procedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by each crewmember in the performance of both sequential and concurrent tasks.

RP 90-10B Task Analysis of the CH-47D Mission and Decision Rules for Developing a CH-47D Workload Prediction Model. Volume II: Appendixes F-I

Bierbaum, C.R.; Aldrich, T.B. February 1990. (AD A221 805) A mission scenario was used to conduct a comprehensive task analysis for CH-47D operations. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission. Nine phases, 37 segments, 66 functions, and 154 tasks were identified. The crewmember performing each task was identified and estimates of the sensory, cognitive, and psychomotor workload associated with the tasks were derived. Estimates of the task times were also derived. The mission/task/workload analysis data were used to develop a computer model of workload for CH-47D crewmembers. The models used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decisions rules were written to specify the procedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by each crewmember in the performance of both sequential and concurrent tasks.

RP 90-11 Predicted Decay of Mobile Subscriber Equipment (MSE) Operator Skills, Sabol, M.A.; Chapell, L.G.; Meiers, C.

February 1990. (AD A220 023) Using the TRADOC skill retention model, predicted decay functions for 85 skills needed to operate the Mobile Subscriber Equipment (MSE), a new high-tech communication system, were computed. These skills relate to the operating procedures for MOS 31D, MOS 31F, and MOS 31F/ASIV4. Researchers applied the model using individual interviews with three subject matter experts for each MOS. Separate predictions were made for using and not using a technical manual. For each of the 85 operating procedures, a chart was constructed that predicts proficiency for up to 12 months after training. Most MOS 31D procedures were predicted to be well retained, while most MOS 31F/V4 procedures were predicted to be

poorly retained; MOS 31F procedures were intermediate.

RP 90-12 Special Forces Leaders' Guide: Operational Detachment Personnel, Shipley, B.G.; Winn, R.B.; Thompson, T.J. March 1990. (AD B143 135) The Special Forces Operational Detachment leader and Mobile Training Team member must make many complex training and operational decisions under conditions of fatigue and stress. While the leader's duties have increased in difficulty, there have been no effective, standardized job performance aids available to assist with mission accomplishment. *The Special Forces Leaders' Guide: Operational Detachment Personnel* (SFLG) is a modular job performance aid system for Special Forces leaders to use under field conditions. The SFLG is designed to (1) be fully usable under operational conditions; (2) have a standardized format; (3) be a modular, highly flexible system; (4) provide fast information retrieval; (5) be easily personalized to individual need, job assignment, mission requirements, equipment availability, and areas of operations; (6) be easily supplemented by higher commanders; and (7) meet low light and adverse weather condition requirements (when reproduced on protected paper stock). *The Special Forces Leaders' Guide: Operational Detachment Personnel* provides individuals and units with common Special Forces basic skill, intelligence, and operations task information in a job performance aid format that eliminates the need to transport large volumes of doctrinal and training support materials on field operations.

RP 90-13 Trainer's Guide: Personal Computer (PC) Version of the Basic Rifle Marksmanship Program for the Multipurpose Arcade Combat Simulator (MACS), Purvis, J.W.; Wiley, E.W. March 1990. (AD A221 732) The Multipurpose Arcade Combat Simulator (MACS) system is a

low-cost, part-task weapons trainer that has been validated as a teaching device with entry-level soldiers. The system may be used for preparatory, basic, sustainment, and remedial training. The PC Version of MACS requires the following equipment and components: M16 rifle with a light pen attached to the barrel; IBM-AT-compatible computer, keyboard, and high resolution color monitor; PXL-380 high resolution light pen board; EGA color graphics board; and the PC Version of the MACS Basic Rifle Marksmanship (BRM) program. MACS allows soldiers to practice BRM skills by firing at targets at scaled ranges displayed on the computer screen. Diagnostic feedback is provided on the screen. The PC Version of the BRM program is comparable to the Commodore version of the BRM program. Both are intended to provide part-task training in BRM. The Trainer's Guide for the PC Version of BRM is intended to accompany each MACS PC Version assembly kit. The guide provides instructions for assembly of the MACS system, using the menu, aligning the light pen, and an extensive description of the BRM program.

RP 90-14 Threat Presentations for Selected Battlefield Scenarios, Doyle, E.L. March 1990. (AD A221 289) This collection of threat-based scenarios was developed to demonstrate a methodology for threat specifications and development by producing specific products to be used as standardized initiators for tank gunnery training and testing situations. The resulting products include 6 initial scenarios, each supported by 6 subsequent scenarios, for a total of 42 target array depictions. Also included are 7 scenario enhancements, which are threat capabilities, other than combat units, that can be introduced with any initial or subsequent scenario to enhance the threat domain employed.

RP 90-15 Task Analysis/Workload (TAWL) User's Guide Version

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3.0, Bierbaum, C.R.; Fulford, L.; Hamilton, D. March 1990. (AD A221 865) The Task Analysis/Workload (TAWL) methodology predicts operator workload using the information produced from a task analysis of the system. In addition, the TAWL Operator Simulation System (TOSS) performs all the database management and model execution functions needed to use this method. This user's guide contains a description of the TAWL methodology and instructions for generating a workload prediction model using TOSS software. Part I of the guide presents an overview of the TAWL methodology; each of the three major phases of the methodology (Task and Workload Analyses, Model Construction, and Model Execution) is described in detail. A glossary is provided to define the use of many of the terms. Part II presents step-by-step instructions for use of the menu-driven Version 3.0 of the TOSS software. Examples of the workload rating scales and TOSS output are provided to support the application of the methodology.

RP 90-16 The 1989 ARI Recruit Experience Tracking Survey: Descriptive Statistics of NPS (Active) Army Soldiers, Benedict, M.E. March 1990. (AD A223 049) This is one of two reports produced to document the 1989 Army Research Institute Recruit Tracking Survey (RETS). RETS is a longitudinal survey of 1986 and 1987 New Recruit Surveys respondents originally surveyed at the eight U.S. Army Reception Battalions during their first 3 days of active duty. This volume describes the project background, use of tabular description data, and interpretation of the chi-square statistic. Technical appendixes include examples of descriptive statistics pages and index, descriptive statistics for all survey items, and a copy of the RETS questionnaire.

RP 90-17 The 1988 Troop Program Unit Attritee Research Project: Tabular Descriptions of the Army Na-

tional Guard, Bray, R.M.; Theisen, A.C. April 1990. (AD A225 117) The 1988 Troop Program Unit (TPU) attritee research project forms a part of the FY87-88 U.S. Army Reserve (USAR) Personnel Research Strategy to enhance retention in the Total Army. The purpose of the survey was to identify the causes of early attrition from Troop Program Units in the Army National Guard and the Army Reserve and to recommend solutions to the problem of USAR and Army National Guard retention. This volume presents the findings from the National Guard TPU attritees. A companion volume details the methodology for the entire TPU project and presents findings from the companion survey of U.S. Army Reserve Troop Program Unit attritees. In both volumes, tabular descriptions of respondents' stated reasons for leaving are cross-tabulated with characteristics of attritees, their units, their civilian employment, and their families.

RP 90-18 The 1988 Troop Program Unit Attritee Research Project:

Tabular Descriptions of the U.S. Army Reserve, Bray, R.M.; Theisen, A.C. May 1990. (AD A225 116) The 1988 Troop Program Unit (TPU) attritee research project forms a part of the FY87-88 U.S. Army Reserve (USAR) Personnel Research Strategy to enhance retention in the Army. The purpose of the survey was to identify the causes of early attrition from Troop Program Units in the Army National Guard and the Army Reserve and to recommend solutions to the problem of USAR and Army National Guard retention. This volume presents findings from the survey of U.S. Army Reserve Troop Program Unit attritees. A companion volume presents the findings from the National Guard TPU attritees. In both volumes, tabular descriptions of respondents' stated reasons for leaving are cross-tabulated with characteristics of attritees, their units, their civilian employment and their families.

RP 90-19A Hardware Versus Manpower Comparability Methodology

(Overview and Manager's Guide) (Volume 1 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990.

(AD A225 122) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume addresses the planning and conducting of an HCM analysis. Procedures are provided for determining the analysis scope and estimating the resources required for the analysis. Preparation of the quality assurance plan and establishment of the consolidated database are explained. The relationship between HCM results and various Army MPT documents is also discussed.

RP 90-19B Hardware Versus Manpower Comparability Methodology

(Step 1: Systems Analysis) (Volume 2 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990. (AD A225 745)

The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology

(HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume deals with system analysis, which establishes the foundation for the entire HCM analysis. Systems are defined; equipment hierarchies are established; missions, functions, and usage rates are determined; operator and maintainer tasks are identified; and reliability and maintainability (R&M) characteristics are determined.

RP 90-19C Hardware Versus Manpower Comparability Methodology

(Step 2: Manpower Requirements Analysis) (Volume 3 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990.

(AD A225 746) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early

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MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume addresses manpower requirements of operators and maintainers. The required Military Occupational Specialties (MOS) and Additional Skill Identifiers (ASI) are identified and the total requirements of each are determined in this step.

RP 90-19D Hardware Versus Manpower Comparability Methodology

(Step 3: Personnel Pipeline Analysis)
(Volume 4 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990. (AD A225 747) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Require-

ments Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume addresses the methods of determining the number of soldiers that must be in the personnel pipeline to sustain the manpower needs (determined in step 2). Promotion, attrition, migration, and transients, trainees, holdees, and students (TTHS) rates are considered in establishing the "steady state" personnel pipeline requirements.

RP 90-19E Hardware Versus Manpower Comparability Methodology

(Step 4: Training Resource Requirements) **(Volume 5 of 7)**, Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990. (AD A225 748) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Pro-

gram for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume addresses methods of determining training resource requirements for the new system. Training tasks, courses of instruction, and resource requirements are analyzed.

RP 90-19F Hardware Versus Manpower Comparability Methodology

(Step 5: Impact Analysis) (Volume 6 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Gup-

till, R.; Park, J. May 1990. (AD A225 733) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume deals with the review of the HCM analysis results and the assessment on the Army's resources. Methods of tracing unex-

pected results to their sources to verify or correct the findings are explained. Valid results that impose excessive demands on Army resources identify candidates for tradeoff analysis to reduce MPT costs.

RP 90-19G Hardware Versus Manpower Comparability Methodology

(Step 6: Tradeoff Analysis) (Volume 7 of 7), Herlihy, D.; Bondaruk, J.; Nicholas, G.; Guptill, R.; Park, J. May 1990. (AD A225

732) The Army Hardware Versus Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems. The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness. This volume addresses identification and selection of tradeoff options. System design or concept alternatives are identified that will reduce the effect of "high drivers" (identified in Step 5, Impact Analysis) on MPT resources. The constraints on tradeoffs are discussed.

RP 90-20 Abbreviated Assessment of Embedded Training for the Howit-

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zer Improvement Program M109A6 Howitzer, Schopper, A.W.; Pierce, L.G.; Johnson, R.W. May 1990. (AD A224 058) For this study, researchers assessed the Embedded Trainer (ET) on the Howitzer Improvement Program (HIP) self-propelled M109A6 howitzer. The research addressed (a) subjective evaluations of the perceived merits of the ET rendered by four subject matter experts (SMEs), (b) subjective reactions to the Level III scenario by 18 HIP-naive 13B soldiers considered to be viable candidates for the chief-of-section (COS) position, (c) measures of the hands-on performance of these same HIP-naive 13Bs during exposure to the ET Tutorial (Levels I and II) and a Level III scenario, (d) a detailed screen-by-screen review of the tutorial portion of the ET, and (e) other procedural matters observed during the preparation for and conduct of the assessment. Perceptions of the HIP ET by the SMEs and 13Bs were positive. The ET was perceived as logical, practical, needed, and relevant by the SMEs and as interesting, effective, and satisfactory by the 13B soldiers. A need for additional hardware, communication software, and pertinent documentation was identified at the outset to enable operator performance summaries to be offloaded. Objective performance data revealed that HIP-naive 13Bs with GT scores above 110 (Mental Categories I-II) made fewer errors and completed tasks (initialization and ammo entry) more quickly than did soldiers with GT scores less than 110 (Mental Categories III-IV). The screen-by-screen review of the tutorial revealed the need for modifications to enhance screen interpretability (e.g., the elimination of multiple commands within a single screen, the revision of some of the terminology employed, more consistent use of terms, as well as a more consistent relationship between keys and their related functions). The early-configuration ET evaluated required that considerable assistance and information be provided to the participants by SME-observers before the tutorial and during

the transition between the tutorial and the Level III scenario. Recommendations addressed the need to (a) provide the additional hardware, software, information, and screen revisions and additions required to conduct training and enhance its effectiveness, and (b) undertake follow-on research to assess the impact of these changes.

RP 90-21 Conducting Precision Range and Integrated Maneuver Exercise (PRIME) After-Action Reviews, Witmer, B.G. June 1990. (AD A225 130) The Precision Range and Integrated Maneuver Exercise (PRIME) is a prototype tactical gunnery and maneuver training system being developed by PM TRADE in conjunction with III Corps at Fort Hood. PRIME is designed to train armored vehicle crews and platoons in combat skills and measure their performance in a realistic setting. PRIME contains multi-media feedback systems that present detailed performance data to the unit. This report includes procedures for formatting and using the information provided by the feedback media and illustrates selectable data formats, each designed for a particular data reporting requirement. The report includes a firing events format, a marksmanship format, a vulnerability format, a weapon and target selection format, and two summary formats. The performance measurement capabilities of the basic Thru-Sight-Video (TSV) are discussed and a need for additional TSV recording and playback feature is identified. The capabilities of a map graphics display medium are also discussed and desired capabilities are identified. Time constraints for organizing and presenting information during the after-action review suggest that the PRIME feedback sources should be integrated for more efficient presentation of the data.

RP 90-22 An Analysis of Tank Platoon Operations and Their Simulation on Simulation Networking (SIM-

NET), Drucker, E.H.; Campshire, D.A. June 1990. (AD A226 956) This report identifies the capabilities and limitations of SIMNET for simulating the tactical activities performed by tank platoons. SIMNET was not developed as a training device, but as a simulator for demonstrating a new technology for simulation networking. Despite its origin as a device for demonstrating networking technology, SIMNET's fidelity as a combat simulator suggests that it can function as a device for training tactical skills. Before it can be used effectively to train tactical skills, however, it is necessary to identify the tactical activities that can and cannot be performed on SIMNET. Researchers began with an analysis of armor operations to identify the activities performed by platoon leaders and other platoon personnel during platoon drills, offensive missions, and special operations. Once these activities were identified, the research staff attempted to perform a representative sample of the activities on SIMNET. The outcomes of these attempts were summarized on a checklist. Tasks involving planning and radio communications could be performed at the highest level of fidelity. Many other tasks could be performed only at lower levels of fidelity, either because critical cues were not accurately simulated or because the responses to these cues differed from those that would be made in combat. Finally, some tasks, such as open hatch operations, could not be performed at all because their capability was not simulated. These results suggest that trainers should ensure that soldiers who train on SIMNET are aware of the difference between the performance of combat operations on SIMNET and their performance in actual combat.

RP 90-23 Assessment of Special Forces Reserve Component Training

Capabilities, Shipley, B.G.; Thompson, T.J.; Dewey, G.I.; Madison, M.J.; France, A. June 1990. (AD B146 994) The First Special Operations Forces Command assessed the capa-

bility of its reserve component forces, including its U.S. Army Reserve and U.S. Army National Guard Special Forces Groups, to achieve current training standards. All active and reserve Special Forces groups are assigned similar special operations missions based on common standards, while the reserve components have roughly 20 percent of the training time that is available to active component groups. The training capabilities assessment was done to determine and brief to higher commands: (1) the capability of each of the four reserve groups to train for all four Special Forces missions, (2) the training requirements and resource demands placed on the units by specialty teams, and (3) the potential training detractors within the reserve units. The results of the capabilities assessment were briefed to the Commander-in-Chief, U.S. Army Special Operations Command, and to appropriate Department of the Army and Defense personnel by the Deputy Commander (Reserve), 1st Special Operations Command.

RP 90-24 Distributed Training for the Reserve Component: Instructor Handbook Conferencing, Harbour, J.L.; Daveline, K.A.; Wells, R.A.; Shurman, D.L.; Hahn, H.A. August 1990. (AD A229 167) This handbook provides background and teaching recommendations for instructors who will conduct Reserve Component (RC) training using asynchronous computer conferencing techniques. The recommendations are based on (1) an international review of the literature in distance learning and (2) experience gained from developing and conducting RC training. The Handbook is based on a model of remotely conducted distributed training called a System for Managing Asynchronous Remote Training (SMART). The cornerstones of the model are that training is *asynchronous, computer-mediated, and distributed* to soldiers' homes. Students work together as a group by asynchronously commu-

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nicipating with each other and the instructor(s) using computer conferencing; lessons may be paper-based, computer-based, or audio/video-based. The handbook is divided into three sections: (1) background information on the SMART model and the typical characteristics of adults learning at home; (2) techniques for conducting SMART classroom training (e.g., group and individual learning techniques, motivational techniques); (3) method for troubleshooting likely course problems (e.g., computer problems, lack of progress or achievement). A companion *Handbook for SMART Course Conversion and Implementation* is also available.

RP 90-25 Distributed Training for the Reserve Component: Course Conversion and Implementation Guidelines for Computer Conferencing, Hahn, H.A.; Harbour, J.L.; Wells, R.A.; Schurman, D.L.; Daveline, K.A. August 1990. (AD A228 200) This handbook uses asynchronous computer conferencing techniques to provide background courses and guidelines for designers and developers of Reserve Component training. The recommendations in this handbook are based on (1) an international review of the literature in distance learning, and (2) experience gained from developing and conducting Reserve Component training. The handbook is based on a model of remotely conducted, distributed training called A System for Managing Asynchronous Remote Training (SMART). The cornerstones of the model are that training is *asynchronous* in time, *computer-mediated*, and *distributed* to soldiers' homes. The guidelines are intended to supplement the Systems Approach to Training process, emphasizing the steps course designers must expand to accommodate conferencing for distributed training. Specific guidelines are given for the analysis, design, and development phases; examples and blank worksheets are also included.

RP 90-26 Tactical Planning Workstation Software Description, Packard, B.R. September 1990. (AD A229 270) This document describes the Tactical Planning Workstation software, including a dBASE scenario development system and a dBASE data recording and analysis system. These systems are integrated into the Experimental Development Demonstration and Integration Center (EDDIC) facility at the U.S. Army Research Institute Field Unit at Fort Leavenworth, Kansas. The Tactical Planning Workstation Functional Description provides a description of the system and definition of terms. This software document is for programmers who require detailed knowledge of the software, data files, and command files.

RP 90-27 Systematic Organizational Design (SORD) Methodology: A Primer, Christ, R.E.; Conroy, J.A.; Briggs, A.L. September 1990. (AD A230 103) The Systematic Organizational Design (SORD) methodology is a user-oriented, computer-assisted tool that uses a standardized process and structure to design an Army organizational unit up through company level. This report describes the background and status of SORD development, presents an overview of SORD methodology, and uses examples taken from a field test of SORD to illustrate each major component of the methodology. The three major components of SORD are the (1) Mission to Function System, which designates and translates mission requirements; (2) Unit Design System, which designs a structured unit comprised of the appropriate numbers and types of major materiel and personnel assets; and (3) Design Evaluation System, which assesses and verifies the match between mission requirements and unit capabilities. SORD also incorporates a crew and a cell database and a report producing module. The report also discusses the benefits that can be derived from the recent institutionalization of SORD and its future refinements.

RP 90-28 Tactical Planning Workstation Functional Description, Flanagan, J.P.; Fallensen, J.J. September 1990. (AD A230 104) This report describes the features of the Tactical Planning Workstation. The Workstation was developed as a platform for prototyping staff information and decision aids and conducting research on staff performance. This functional description owes an overview of the capabilities of the Workstation and tells how a staff user would interact with the system to perform general information processing tasks or specific tactical planning tasks. The report includes descriptions of the hardware, networking, input and control techniques, data base, displays, and functions of the Workstation. The Workstation was developed by the Experimental development, Demonstration and Integration Center or EDDIC. Related reports are available on detailed software documentation and user interface evaluation. The Tactical Planning Workstation is being used to conduct soldier performance research on choices of tactical courses of action.

RP 90-29 Workspace Design Handbook for Standardized Command Posts, Fallensen, J.J.; Quinkert, K.A. September 1990 (AD A229 985) This handbook was developed for use in the Army Chief of Staff's Standardized Command Post program. It provides recommended design techniques, assessment approaches, sample operational considerations, human factors guidelines, and implementation advice for the design of Army tactical command posts. All information in the handbook is based on subject matter experts' knowledge of human factors design and soldier performance. The handbook discusses operational considerations in terms of standardization and establishment of operational requirements for workspace design. It also points out the need to go beyond arranging equipment in command post design and describes how to incorporate the soldiers and their missions in design.

RP 90-30 Incorporating Operator Workload Issues and Concerns Into the System Acquisition Process: A Pamphlet for Army Managers, Christ, R.E.; Bulger, J.P.; Hill, S.G.; Zaklad, A.L. September 1990. (AD A228 489) This pamphlet defines and discusses the concept of workload as it relates to modern "high technology" systems. It also identifies Department of Defense and Department of the Army policy, regulations, and responsibilities for ensuring that operator workload (OWL) issues and concerns are incorporated in the Army material acquisition process and offers suggestions on what management-level decision makers should know to adequately address OWL at each stage of the acquisition process. After defining OWL as the relative capacity to perform, the authors take the position that limited performance capabilities of the human component of a system must influence the requirements and design of a system in much the same way as do limited capabilities of materiel components. If OWL is not considered early and continuously during the design, development, and evaluation of a system, the Army will not know if the system makes excessive demands on the operator until it is too late for a cost-effective solution. The guidance provided is based on the relationship between OWL and the Army manpower and personnel integration (MANPRINT) initiative and on the key role of the system MANPRINT management plan (SMMP) and the MANPRINT joint working group (MJWG) in addressing and tracking OWL issues and concerns throughout the acquisition process. This guidance promotes efforts to ensure total system effectiveness by continuous integration of all information relevant to soldier performance and reliability into the system development process.

RP 90-31 Human-Computer Interaction in Tactical Operations: Designing for Effective Human-Computer Dialogue, Obermayer, R.W.; Fallesen, J.J. Sep-

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tember 1990. (AD A230 069) This report presents guidelines for designing human-computer dialogue for tactical operations. Researchers consolidated sources of information into a form intended for use by designers of tactical computer systems to give them a basis to assess the military impact of dialogue design and take leadership in improving the usability of future systems. This report was developed to support dialogue design for two general situations: (1) the generation of specifications for relatively large-scale systems in which the specific design and development will be performed by another, and (2) the development of relatively small-scale special-purpose systems in which the reader will be the designer and developer, perhaps with the aid of a programmer. The user-computer dialogue is clearly the key to developing systems that fit in with users' goals and tasks. Consequently, this guide will emphasize the essence of the dialogue, clarification of fundamental issues, performance of front-end analyses, selection between alternative dialogue types, and testing for usability. This guide will *not* address (at least to any major degree) the issues of data display, contents of on-line documentation and help, data transmission, hardware devices, or general human engineering considerations. For those interested in reading further, a reading list and a selected bibliography are provided.

RP 90-32 Implementation Guide for Assessing Intelligence Production Effectiveness, Burnstein, D.D.; Fichtl, T.; Landee-Thompson, B.; Thompson, J. September 1990. (AD A229 870) The methodology presented in the Implementation Guide for Assessing Intelligence Production Effectiveness is driven by the users of intelligence. The Guide contains procedures and forms that enable users of intelligence to identify and prioritize their intelligence requirements, set standards for those requirements, and judge how well the requirements were met. The

Guide also contains suggestions and forms for analyzing the user ratings, developing a diagnostic plan to determine the causes for deficiencies, conducting an inquiry, and providing feedback to the commander and G2.

RP 90-33 Techniques to Aid Department of Defense (DoD) Writers in Developing User-Oriented Directives, Kern, R.P.; Holland, M.V.; Harman, J.; Bell, S. September 1990 (AD A229 962) This report draws upon findings from document design research to identify key features of effective work-oriented documents and presents techniques writers can use to identify potential users and their diverse needs for information. A technique is presented for structuring and monitoring organization of drafts to produce a document that effectively addresses the users' needs. Guidelines are presented for deciding when special formats should supplement or replace standard text. The report also presents key features of clear writing reflected in structuring of sentences and paragraphs and in choice of words.

RP 91-01 Range Target System (RTS) Operations Manual, Barber, A.V. October 1990. (AD A230 095) Range Target System (RTS) is a high-fidelity engagement simulator. Short Range Air Defense (SHORAD) and Forward Area Defense System (FAADS) crews employ their actual weapons in simulated or live fire engagement of sub-scale, fixed-wing and rotary-wing aircraft. RTS permits training and evaluation of individuals, crews, and platoons, provides detailed crew performance scoring and feedback, and can be moved from one location to another and rapidly put in place for a new training exercise or test application. This operations manual describes the major RTS components (targets, range control station, data acquisition station, position-location station, and laser ballistics simulator), RTS set-up procedures, RTS system preparation and installation pro-

cedures, and RTS operations, maintenance, and supply. Two separately published annexes to this manual exist. Annex 1 describes the Pop-Up Target System operations and maintenance. Annex 2 describes the Flying Target System operations and maintenance. These three manuals provide the maximum documentation necessary to support RTS.

RP 91-02 Range Target System (RTS) Operations Manual: Annex 1; Pop-Up Target System (PTS) Operations and Maintenance Reference Manual, Berry, G.M.; Barber, A.V. October 1990. (AD A230 096) Range Target System (RTS) is a high-fidelity engagement simulator. Short Range Air Defense (SHORAD) and Forward Area Air Defense (FAADS) crews employ their actual weapons in simulated or live fire engagement of sub-scale, fixed-wing, and rotary-wing aircraft. RTS permits training and evaluation of individuals, crews, and platoons, provides detailed crew performance scoring and feedback, and can be moved from one location to another and rapidly put in place for a new training exercise or test application. This reference manual describes the Pop-Up Target System(PTS) component of RTS. All relevant operations and maintenance procedures are discussed, along with a detailed description of the Pop-Up Target System, PTS power and environmental requirements, necessary test equipment, and important safety considerations. This PTS reference manual is Annex 1 to the separately published RTS Operations Manual.

RP 91-03 Range Target System (RTS) Operations Manual: Annex 2; Flying Target System (FTS) Operations and Maintenance Reference Manual, Berry, G.M.; Barber, A.V. October 1990. (AD A229 890) Range Target System (RTS) is a high-fidelity engagement simulator. Short Range Air Defense (SHORAD) and Forward Area Air Defense System (FAADS) crew employ their actual weapons in simulated or live fire engage-

ment of sub-scale, fixed-wing and rotary-wing air-craft. RTS permits training and evaluation of individuals, crews, and platoons, provides detailed crew performance scoring and feed-back, and can be moved from one location to another and rapidly put in place for a new training exercise or test application. This reference manual describes the Flying Target System (FTS) component of RTS. All relevant operations and maintenance procedures are discussed, along with a detailed description of the Flying Target System major components (aircraft, aircraft communications, voice communications mobile launcher, and ground support equipment), as well as a complete listing of needed tools and spare parts. This FTS reference manual is Annex 2 to the separately published RTS Operations Manual.

RP 91-04 The 1990 ARI Survey of Employers: Technical Manual/Codebook, Schroyer, C.J.; Hansen, L.A.; Benedict, M.E. October 1990. (AD A231 740) This is one of two reports produced to document the 1990 U.S. Army Research Institute for the Behavioral and Social Sciences Survey of Employers. The Survey of Employers was designed to obtain civilian employers' perceptions of the availability and importance of the skills and abilities that can be acquired by all first-term enlisted soldiers. These data are being used to develop a model of the influence employers' attitudes and practices may have on Army enlistments. Survey questionnaires were mailed to a stratified random sample of 2, 145 presidents and chief executive officers of American businesses. This volume documents the methods used for the employer survey project. Technical appendixes include a data codebook, survey instrument, and administrative documents.

RP 91-05 Precision Range Integrated Maneuver Exercise (PRIME) User's Guide, Kraemer, R.E.; Koger, M.E. January 1990. (AD A233 411) This report is

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a user-oriented document on the Precision Range Integrated Maneuver Exercise (PRIME) device-based training system. It is intended for use by armor and mechanized infantry units considering using PRIME to meet their gunnery and tactical training needs. The User's Guide consists of two chapters, an appendix, and a glossary. The first chapter describes the PRIME system, including system operation, subsystems and elements, and site organization. The second chapter provides guidance for planning, implementing, and evaluating individual, crew, and platoon-level training using PRIMES. Appendix A assists unit leaders in selecting tank platoon-level tasks for PRIME training. The glossary defines the acronyms and abbreviations used in the Guide.

RP 91-06 Computer-Mediated Communications for Distance Education and Training: Literature Review and International Resources, Wells, R.A. January 1990. (AD A233 458) This report offers Army instructors and instructional designers a practical review of research findings on the successful implementation of computer-mediated communication (CMC) for distance education and a reference guide to international resources useful to both researchers and practitioners. The report summarizes and integrates material drawn from a wide range of international resources, including distance education journals, internal reports, conference papers, ERIC documents, and books and journals pertaining to education, psychology, technology, computers, and communication. Part I of the report, the literature review, provides instructors and instructional designers with practical knowledge regarding the design and implementation of distance training with CMC, including relevant knowledge about specific needs of distance students. Example topics include frequency of feedback; effective design and implementation of group activities; shifts in instructor role for a distance environ-

ment; characteristics of successful distance students and instructors; and recommendations for pacing of students and instructors. Part 2 contains various resources and overviews, including a selected list of international distance teaching institutions; a discussion of distance and graduate study; annotation and charts on educational and communication applications of CMC; an overview of conferencing software including addresses for the vendors; an international list of distance education; and a selected bibliography of references in distance education, CMC, information technology, media selection, and adult education.

RP 91-07 Measures of Effectiveness Compendium, Feng, T. January

1990. (AD A233 377) This report presents and defines a variety of Army-relevant measures of effectiveness (MOEs). They have been classified by general type of system and by function. The report also includes a cross-referenced index for alternate access and convenience. The report discusses the nature of MOEs and their relationship to operational testing.

RP 91-08 Army Synthetic Validity Project: Report of Phase III Results Volume II. Research Instruments, Wise, L.L.; Peterson, N.G.; Hoffman, R.G.; Arabian, J.M. February 1991. (AD A235 636) The Army Synthetic Validity Project developed and evaluated a series of alternative procedures for (a) analyzing critical components of jobs, (b) obtaining expert judgments of validities of individual attributes for predicting critical performance components, (c) establishing prediction equations for specific jobs when criterion-related validation data were not available, (d) estimating criterion-referenced performance standards for specific jobs, and (e) specifying scores on the predictor battery necessary to achieve the desired performance standard, given the bivariate distri-

bution between predictor scores and performance scores. The results and conclusions obtained for each of these activities follow. As a consequence of results obtained in earlier phases of the project, the attribute model and the job behavior method were set aside and the questionnaire based on tasks performed became the tool of choice. While all methods provided reliable descriptions, the task questionnaire yielded greater discriminability across MOS and had higher acceptability among the judges. Judgments about the validity of human attributes for predicting job descriptor elements proved to be particularly robust across judges, who differed across a fairly wide range of relevant psychological training and experience. The synthetic validation methods produced equations that have only slightly lower absolute validities than least squares equations developed directly on the jobs, depending on the criterion and method of forming the synthetic equation. The most significant conclusion of the standard setting research was that the different methods developed and evaluated led to different results. Very strict standards were set when performance was described in terms of "percent go" scores on hands-on task performance tests. Researchers developed a computer program to demonstrate the linkage between test scores and acceptability levels. The program uses a database with the linkage relationships estimated for the MOS included in this project. This database includes performance cut scores for each MOS and also regression slope, intercept, and error variance parameters. The user may vary additional parameters to obtain the percentage of recruits expected to perform at each level of acceptability. Other research related to this phase of Project A appears in ARI Technical Report 922, Army Synthetic Validity Project: Report of Phase III Results: Volume I.

RP 91-09 Operations Planning Tools (OPT) Functional Description,

McKeown, P.E.; Fallesen, J.J.; Perkins, M.S.; Ross, C.G. March 1991. (AD A235 665) The Operations Planning Tools (OPT) are an integrated set of aids to assist Army tactical planners in developing and evaluating courses of action. This report describes the background of, concepts for operation, and functional capabilities of OPT. The concepts for OPT were generated from an analysis of combat staff officers performing critical planning tasks. Functions were allocated to the planner and to the computer support tools according to relative strengths and weaknesses. OPT was designed to provide support in visualization, computing estimates, and information management functions to support rapid revisions in encoded concepts and projects of battle outcomes.

RP 91-10 User's Guide for the MANPRINT Reference Retrieval System, Hunter, D.R. April 1991. (AD A239 915) This report describes the installation and use of the MANPRINT Reference Retrieval System (MANRRS). MANRRS is a menu-driven system used for the identification of references related to one or more of the domains subsumed by MANPRINT. MANRRS includes both a database with indexed entries on MANPRINT domain and record type (i.e., regulation, standard, technical report, etc.) and the retrieval software program written in dBase III command language. A valid copy of dBase III Plus is required to use MANRRS.

RP 91-11 Task Analysis/Workload User's Guide Version 4.0, Hamilton, D.B.; Bierbaum, C.R.; Fulford, L.A. April 1991. (AD A241 861) The Task Analysis/Workload (TAWL) methodology was developed to predict operator workload using the information produced from a task analysis of the system. Subsequently, the TAWL Operator Simulation System (TOSS) was written in Turbo Pascal to perform all the database management and model execution functions

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needed to use the methodology on an IBM compatible computer. This user's guide contains a description of the TAWL methodology and instructions for generating a workload prediction model using the TOSS Version 4.0 software. Part I of this guide presents a global overview of the TAWL methodology; each of the three major phases of the methodology (Task and Workload Analyses, Model Construction, and Model Execution) are described in detail. A glossary is provided to define the use of many of the terms. Part II presents step-by-step instructions on the use of the menu-driven Version 4.0 of the TOSS software. Examples of workload rating scales and TOSS output are provided to support the application of the methodology.

RP 91-12 Survey Costs and Errors: Manual for the Lotus 1-2-3 Spreadsheet, McGuire, D.P. April 1991. (AD A243 415) This report is a user's guide for a prototype spreadsheet program written in Lotus 1-2-3 (Version 3.1) to estimate survey costs and errors. Input to the spreadsheet includes basic survey parameters, underlying costs, and estimates of time needed to perform survey tasks. Users can select the survey sampling plan, method of survey administration, survey medium, and other aspects of the survey project. Output of the program is graphical. The spreadsheet was created to apply to surveys of U.S. Army recruits or prospects, but can be used in nonrecruiting survey situations as well. Appendixes contain the code necessary to build the spreadsheet. This report is the second of two reports on this project. The first (Borgida, Sullivan, McGuire, & DuBois, 1991, ARI Technical Report 928) contains the technical report that discusses the recruiting process, analyses of seasonality in ongoing surveys of accessions, and a general model of survey costs and errors.

RP 91-13 Task Analysis for the Combat Vehicle Command and Control

(CVCC) System, Wigginton, D.; O'Brien, L.H. June 1991. (ADA A240 292) This research product describes the results of a task analysis conducted to support research efforts on the Combat Vehicle Command and Control (CVCC) system. The CVCC is a set of selected futuristic components with functions simulated in the Close Combat Test Bed (CCTB) environment. The objective of the task analysis was to provide the minimum essential task information needed to support (a) the early assessment of CVCC training requirements, and (b) the development of simulation models of CVCC operator task performance.

RP 91-14 A Guide for Early Embedded Training Decisions, Witmer, B.G.; Knerr, B.W. June 1991. (AD A239 669) Embedded Training (ET) is training that is built into or added to a weapons system. Although Army policy requires training developers to consider ET first among training options, effective implementation of this policy has been hampered by the lack of specific procedures to determine what training should be embedded and what should be provided by other means. This report provides a set of guidelines—in the form of detailed decision flowcharts—developed to assist training developers and engineers in making that decision. While task information has traditionally played the primary role in selecting media for training, it is considered less important in deciding when to use ET than the following factors:

- policy
- system availability
- technical feasibility of ET implementation
- effects of ET on system reliability, availability, and maintainability
- impact of ET on system manpower and personnel requirements
- need for training-specific interface hardware
- safety
- cost-effectiveness

These factors, which are incorporated in three sets of flowcharts, are designed to be used in different stages of the acquisition process.

RP 91-15 Battlefield Maintenance Case Study: Task Commonality Analysis for System Maintenance Requirements, Haught, D.; Enwright, J. June 1991. (AD A241 131) In June 1990, the U.S. Army Ordnance Center and School requested that the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) examine the Battle Maintenance System to determine whether the current automotive maintenance system and military occupational specialties (MOS) needed to be restructured. The methods documented in this research product provide a procedural baseline from which to assess MOS restructuring requirements based on the comparison of system maintenance tasks requirements. This research product can be used by Army proponent branches to assess the need for MOS restructuring or merger actions.

RP 91-16 Canceled. *See RN 91-91.*

RP 91-17 Soldier Survey Data Book, Brinkley, M.; Gabel, T.; Tastet, L. July 1991. (AD A242 759) The Army Family Research Program (AFRP) was designed to address the research objectives outlined in the 1983 White Paper by Chief of Staff of the Army (CSA) Meyer and to investigate issues raised by subsequent Army Family Action Plans (1984-1991). To meet these objectives, a worldwide survey of a representative sample of Army soldiers and their spouses and supervisors was distributed in calendar year 1989. This data book provides frequencies of all variables and scales included in the 1989 AFRP Soldier Data File. The data for each variable are broken down by career stage, unit type, location, marital/parental status, employment status of spouse, and age of children.

RP 91-18 Spouse Survey Codebook, Brinkley, M.; Gabel, T.; Bunch, L.; Tastet, L. July 1991. (AD A241 228) Throughout the 1980s, Army leaders and policymakers have been especially concerned about the well being of Army families. Research designed to assist Army leaders in addressing family concerns is an important part of the Army's effort to increase family well being and the sense of partnership between the Army and its constituent families. In response to the call for more Army family research, the Army Family Research Program (AFRP) surveyed the spouses of married soldiers in its 1989 worldwide data collection. Data from approximately 3,400 spouses was obtained and included in the spouse data file. This codebook enables researchers to analyze the spouse data file by providing information on the variables, coding, value labels, and edit flags.

RP 91-19 The 1989 AFRP Soldier and Family Survey Soldier Data File Codebook, Brinkley, M.; Bagel, T.; Bunch, L.; Tastet, L. July 1991. (AD A241 876) The Army Family Research Program (AFRP) was designed to address the research objectives outlined in the 1983 White Paper by Chief of Staff of the Army (CSA) Meyer, and to investigate issues raised by subsequent Army Family Action Plans (1984-1991). To meet these research objectives, a worldwide survey of a representative sample of Army soldiers, their spouses, and their supervisors was distributed in calendar year 1989. This codebook details the weights, scales, variable names, coding, value labels, and edit flags contained in the 1989 AFRP Soldier Data File.

RP 91-20 Army Family Research Program: Select Preliminary Findings on Army Family Support During Operation Desert Shield, Bell, D.B.; Tiggie, R.B.; Scarville, J. July 1991. (AD A242 754) This report compares data collected before Operation Desert Shield (ODS) with that

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collected during ODS. The pre-ODS data were collected in 1989 as part of the Army Family Research Program. The ODS-era data were collected in the fall of 1990 by the United States Army Personnel Integration Center (USAPIC). Overall, ODS-era soldiers were more likely than pre-ODS soldiers to report being able to count on leaders at work, co-workers, Army service agencies, and Army friends and neighbors for help with a problem. ODS-era soldiers were also more likely than pre-ODS soldiers to indicate that their leaders were knowledgeable about Army family programs and that their leaders encouraged unit family activities. Junior enlisted were more likely than the active component (AC), as a whole, to be worried about family expenses and family safety while away on assignment. In addition, junior enlisted were less likely than the AC to indicate that their family had adjusted well to Army demands.

RP 91-21 Social Climate Indicators for the U.S. Army, Futterman, R.; Orlandi, M.; Schinke, S. August 1991. (AD A243 615) This research reviews the literature on social climate indicators and provides information on the psychometric and conceptual properties of the many scales and items that have been used to measure social climate. Areas such as job satisfaction, morale, cohesion, organizational commitment, and quality of life are included. The report provides a general description of relevant technical issues, capsule descriptions of research or other documents in which measures of social climate have been developed or analyzed, and transcriptions of social climate measures and items used in the U.S. Armed Forces and in non-military settings. This report is Part One of two reports resulting from the research project. Part Two is a handbook that contains selected social climate measures as well as a condensed version of this report.

RP 91-22 Handbook of Social Climate Indicators for the U.S. Army, Futterman, R.; Orlandi, M.; Schinke, S. August 1991. (AD A243 405) This report provides a brief review of the literature on social climate indicators, a discussion of psychometric issues, and a collection of the social climate measures deemed the best of those available. Areas such as job satisfaction, morale, cohesion, organizational commitment, and quality of life are included. This report is Part 2 of two reports resulting from the research project. Part 1 reviews the literature on social climate indicators and provides information on the psychometric and conceptual properties of numerous scales and items used to measure social climate. The Part 1 report provides more extensive and detailed information, and includes all of the social climate scales that were located.

RP 92-01 Prototype Methods for Training and Assessing Future Tactical Command and Control Skills, Lickteig, C.W. November 1991. (AD A244 328) This report presents prototype methods for training and assessing selected command and control (C2) skills for future tactical commanders. The methods are designed to support training requirements for vehicle-based automated C2 systems and to overcome some of the current limitations in the training and assessment of tactical C2 skills. The C2 vignette method is designed to rapidly generate standardized, operationally based, C2 training and assessment exercises with a minimum of personnel resources. The situational awareness (SA) measures are designed for objective assessment of a tactical commander's ability to "see the battlefield" and to support quantifying objectives for SA training programs. These prototype methods are provided as tools that can be adapted by training developers and analysts of future C2 systems at simulation-based training and assessment facilities.

RP 92-02 SIMNET Unit Performance Assessment System (UPAS) Users Guide, Meliza, L.L.; Tan, S.C.; White, S.; Gross, W.; McMeel, K. April 1992. (AD A250 699) The networking of combat vehicle simulators in SIMNET is a method of collective training that supplements field exercises. This report offers guidance for using the PC-based Unit Performance Assessment System (UPAS) to collect and analyze data from SIMNET exercises. The UPAS collects network data on vehicle status and firing events during exercises and loads these data into a relational database at the end of the exercise. It contains menus of graph and tables that can be used to analyze unit performance. In addition, it contains graphic aids that integrate network data with unit planning information and terrain data to provide a complete description of unit performance. The UPAS can be used to analyze unit performance after an exercise and aid the trainer in identifying exercise events that contributed substantially to exercise outcomes. Using SIMNET capabilities (for "bird's eye" and "out the window" views) or displays within the UPAS, events can be illustrated as units receive feedback during After-Action Reviews (AARs).

RP 92-03 Methods for Determining Resources and Proficiency Trade-offs Among Alternative Tank Gunnery Training Methods, Hoffman, R.G.; Morrison, J.E. April 1992. (AD A250 867) Tank Gunnery training devices are designed to decrease costs and other resources required for training. To realize savings and, at the same time, maintain desired proficiency, cost-effective tradeoffs must be made between device training and on-tank training. To determine tradeoff specifications, experimental and non-experimental methods were reviewed, critiqued, and synthesized into a set of recommendations. A surrogate method, simulated transfer, which uses judgments from subject matter experts, was modified for gunnery

training problems. Also delineated were nonlinear models needed to guide analysis of learning and tradeoff data. Researchers identified an Army National Guard setting for testing the nonexperimental and simulated transfer research methods. Research focused on the Guard Unit Army Device Full-Crew Interactive Simulation Trainer, Armor (GUARD FIST I). Proficiency ratings, collected on all gunnery training events, showed some ability to predict relative performance from one training event to another, but mean ratings varied dramatically between events, suggesting that the interpretation of the rating scale shifting between raters and events. Amount of practice was negatively correlated with Table VIII, apparently because of a training strategy that gave priority in training time to crews having lower proficiency. The data generated by the simulated transfer methods were reliable but did not fit minimal expectations. For example, the amount of training required to achieve a minimum level of proficiency was severely underestimated compared with the training that actually occurred during the period of the research. Observations of the case-study approach suggestions for improving training processes. For example, researchers found that GUARD FIST I offers a significant time-savings advantage over tank-table training but that instructional guidance for this device does not exist.

RP 92-04 Canceled.

RP 92-05 User's Manual for the Systematic Organizational Design (SORD) Methodology, Kellner, A.J.; Conroy, J.A.; Christ, R.E. May 1992. (AD A255 352) The Systematic Organizational Design (SORD) methodology is a user-oriented, computer-assisted tool to aid combat developers in the design and documentation of organizational concepts for Army units through the company level. SORD consist of three subsystems: (1) the mission to Function Subsystem,

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for defining mission requirements; (2) the Unit Design Subsystem, for developing a structured unit composed of appropriate material and personnel assets; and (3) the Design Evaluation Subsystem, for verifying matches between mission requirements and unit capabilities. SORD also incorporates a crew and cell data base and a report generation module. This manual offers guidance to users of the March 1991 version of SORD. It provides instructions on how to install SORD on a personal computer and information on the user-software interface, instructions for operating each of the major components of the software. It concludes with a discussion of SORD's ability to meet the Army need for a standardized organizational design methodology and a description of some benefits of using SORD. The appendixes contain forms that will provide feedback to SORD developers and proponents. The March 1991 version of the SORD methodology software is available on a set of six 5 1/4-inch low-density (360 K) floppy disks. Individuals wishing to obtain a copy of this software should contact the Army proponent for SORD at the following address:

Deputy Commanding General for Combat Development

ATTN: ATZL-CDF-B (Mr. Kenneth Jones)
Fort Leavenworth, Kansas 66027-5300

The SORD proponent should also be contracted for information concerning more recent versions of the software or editions of the user's manual that have been produced since this manual was published.

RP 92-06 Tactical Command and Control Process, Fallesen, J.J.; Lussier, J.W.; Michel, R.R. July 1992. (AD A255 036) The U.S. Army Command and General Staff College requested that ARI participate in the development of new descriptions of the command and control (C2) process for tactical commanders and staffs. The request was based on information from research on training of group decision making and development of C2

decision aids. These results, along with naturalistic observation of command and staff performance during command post exercises, were used to develop a modified process description. One major principle on which the description is based focuses on the fact that command and control is done to accomplish missions and not to select a best course of action. Other C2 activities are raised in importance in the new description, including situation understanding, battle forecasting, wargaming, synchronization, deception planning, contingency planning, and rehearsals. Practical themes (like commander involvement, allocation and management of planning time, and active error checking) are stressed to facilitate the application of the process.

RP 92-07 Canceled.

RP 92-08 Operations Planning Tools (OPT) User's Guide, Flanagan, J.P.; McKeown, P.E.; McDonald, B.L.; Fallesen, J.J. August 1992. (AD A256 524) Operations Planning Tools (OPT) was developed to assist planners in tactical course of action development, analysis, and selection. This document tells users how to operate OPT and how to integrate it in their planning process. OPT is capable of representing tactical engagements of multiple battalions, the routes of an attacker, combat power ratios, battle duration, and attrition of combat power. A timeline capability is provided to help synchronize attacks along multiple routes. Additional capabilities are available to fit many styles of planning, from the standard estimate-of-the-situation to plans made under extreme time constraints.

RP 92-09 Multiple-Station Range Target System (RTS) Operations Manual, Berry, G. September 1992. (AD A257 243) The Multiple-Station Range Target System (RTS) is a high-fidelity engagement simulator. Short Range Air Defense (SHORAD)

and Forward Area Air Defense System (FAADS) crews employ their actual weapons in simulated or live-fire engagement of subscale, fixed-wing and rotary-wing aircraft. RTS permits training and evaluation of individuals, crews, and platoons; provides detailed crew performance scoring and feedback; and can be moved from one location to another and rapidly deployed for a new training exercise or test application. This operations manual describes the major RTS components (targets, range control station, data acquisition station, position-location station, and laser ballistics simulator); RTS set-up procedures; RTS system preparation and installation procedures; and RTS operations, maintenance, and supply. Two separately published annexes to this manual exist. Annex 1 describes the Pop-up Target System operations and maintenance. Annex 2 describes the Flying Target System operations and maintenance. These three manuals contain the minimum documentation needed to support RTS.

RP 92-10 Multiple-Station Range Target System (RTS) Operations Manual, Annex 1: Pop-Up Target System (PTS) Operations and Maintenance Reference Manual, Berry, G. September 1992. (AD A257 365) The Multiple-Station Range Target System (RTS) is a high-fidelity engagement simulator. Using RTS, Short Range Air Defense (SHORAD) and Forward Area Air Defense System (FAADS) crews employ their actual weapons in simulated or live-fire engagement of subscale, fixed-wing and rotary-wing aircraft. RTS permits training and evaluation of individuals, crews, and platoons; provides detailed crew performance scoring and feedback; and can be moved from one location to another and rapidly deployed for a new training exercise or test application. This reference manual describes the Pop-Up Target System (PTS) component of RTS. All relevant operations and maintenance procedures are discussed, and a detailed description of the Pop-

Up Target System, PTS power and environmental requirements, necessary test equipment, and important safety considerations is provided. This PTS reference manual is Annex 1 to the separately published Multiple-Station Range Target System Operations Manual.

RP 92-11 Multiple-Station Range Target System (RTS) Operations Manual, Annex 2: Flying Target System (FTS) Operations and Maintenance Reference Manual, Berry, G. September 1992.

(AD A257 239) The Multiple-Station Range Target System (RTS) is a high-fidelity engagement simulator. Using RTS, Short Range Air Defense (SHORAD) and Forward Area Air Defense System (FAADS) crews employ their actual weapons in simulated or live-fire engagement of subscale, fixed-wing and rotary-wing aircraft. RTS permits training and evaluation of individuals, crews, and platoons; provides detailed crew performance scoring and feedback; and can be moved from one location to another and rapidly deployed for a new training exercise or test application. This reference manual describes the Flying Target System (FTS) component of RTS. All relevant operations and maintenance procedures are discussed, and a detailed description of the major components of the Flying Target System (aircraft, aircraft communications, voice communications, mobile launcher, and ground support equipment) and a complete listing of needed tool and spare parts is provided. This FTS reference manual is Annex 2 to the separately published Multiple-Station Range Target System Operations Manual.

RP 92-12 An Overview of Intercultural Training: Graduate Level Preparation for Military Service Abroad, Langham, C.K.; Langham, G.D.; Myers, S. September 1992. (AD A257 685) This report provides an overview of more than 1,000 graduate-level international/intercultural training programs. It describes military advanced de-

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gree programs, public sector and federally supported programs, advanced academic degrees in international and area studies, and private sector intercultural training. Using library reference sources, an online data base, university catalogs, and interviews with relevant military personnel, Title VI administrators, university officials, corporate executives, and intercultural consultants, the investigators organized extensive information into program abstracts in U.S. Regional and World Area Guides. The U.S. Regional Guides feature program abstracts identifying over 700 intercultural training programs at 200 institutions of higher education that offer graduate-level programs in degree fields appropriate to prepare military personnel for service abroad. Degree fields include business, security affairs, development studies, international communication, and technology management. The World Area Guides list more than 400 graduate study abroad programs directly linked to major universities in eight world regions. Relevant professional associations and consortia are described.

RP 92-13 Functional Specifications for Selected Staff Workstations within the Close Combat Test Bed's Automated Battalion Tactical Operations Center, LaVine, N.D. September 1992.

(AD A258 241) This report contains functional specifications for simulating an Automated Battalion Tactical Operations Center (BN TOC) within the Close Combat Test Bed (CCTB). These specifications are an important step in simulating new systems and technologies. The simulation allows researchers at the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to address training and soldier performance issues related to command, control, and communications (C3) during the early S3 (Operations), and BN Executive Officer workstation to support mission planning and execution. Descriptions of these staff support functions provide

background information to those interested in the functional and operational details of this BN TOC. Information contained in this report will assist in determining requirements for C3 systems and training development programs for military personnel.

RP 93-01 Combat Leaders' Guide: Leader Handbook, Salter, M.S. February 1993. (AD A263 416) The Combat Leaders' Guide (CLG) is a standardized job performance aid for leaders to use during periods of high stress and fatigue in continuous combat or realistic combat training. The pocket-sized handbook contains tasks from soldiers' manuals and other training materials in easy-to-read checklist format. It is made of waterproof and tear-resistant paper and is fastened with rings that permit insertion or deletion of material. The handbook offers fast information retrieval, can be personalized to individual and unit needs, and can be used under low light and in inclement weather. The CLG is a generic guide and requires little updating. It has shown its usefulness in supporting unit readiness by providing a leader with doctrinal, tactical, and technical materials in a quick-reference format. The CLG helps overcome the effects of performance decay over time by providing a memory jogger for trained soldiers. The original CLG was printed as a test item in 1986; a second edition was printed in 1987 and reprinted in 1990. Based on the many requests for CLGs from units deploying to Operation Desert Shield/Desert Storm, the CLG was revised and printed a final time. The updated edition, Combat Leaders' Guide: Leader Handbook, has been reduced in size but contains all the same material.

RP 93-02 Description of a Tank-Based Automated Command and Control System as Simulated for the Combat Vehicle Command and Control Program, LaVine, N.D.; Lickteig, C.W.; Schmidt, J.H. February 1993. (AD A263459) This research

product describes an automated command and control system developed for simulation-based assessment in the Close Combat Test Bed (CCTB) at Fort Knox. This tank-based system reflects many of the user-interface requirements identified during the course of the U.S. Army Research Institute for the Behavioral and Social Sciences efforts in support of the Combat Vehicle Command and Control (CVCC) program. The system described was used to conduct the CVCC preliminary battalion-level evaluation during January-June 1991. Description of this user-based system may help to ensure its consideration in the Army's development efforts.

RP 93-03 A Review and Annotated Bibliography of Literature Relevant to Armor Skill Retention, Rowatt, W.C.; Schlechter, T.M. February 1993.

(AD A263 407) This research product addresses the progress of research on armor skill retention by reviewing 74 pertinent works. These works include book chapters, empirical studies, review and theoretical articles, and technical and research reports. The main factors affecting military skill retention are categorized and discussed according to training, task, and individual difference factors. The discussion of factors indicates that predicting armor skill retention is difficult because (a) little is actually known about armor skill retention, and (b) interactive effects were found for most of the previously identified elements of skill retention. Potential areas of research are discussed.

RP 93-04 Models of Morse Code Skill Acquisition: Simulation and Analysis, Fisher, D.L.; Townsend, J.T. February 1993. (AD A263 554)

The simulation described in this report predicts details of performance for students learning to copy Morse code at high speeds of transmission. Specifically, the model predicts the probability of a correct response, an incorrect response, a pe-

riod (no guess) response, no response, and a correct response for each of the five serial positions in a group. The simulation also predicts the time it takes to execute both a correct and incorrect response and the time it takes to execute a period response. The model was derived from a cognitive analysis of the information processing demands on students and modeled with order-of-processing diagrams. A preliminary test was conducted with response data from students at the U.S. Army Intelligence School, Fort Devens, Massachusetts.

RP 93-05 Reconfigurable Simulator Specifications for Future Main Battle Tanks Within the Close Combat Test Bed, Lawless, M.T.; LaVine, N.D. March 1993. (AD A268 134)

This research product provides functional specifications for reconfigurable simulators to support research on future main battle tanks in the Close Combat Test Bed (CCTB). A key factor in maximizing the use of networked simulation for research is the flexibility or reconfigurability of the vehicle simulator. Efforts to enhance human performance or to assess alternative embedded training systems, for example, must begin with descriptions of the proposed simulation functionality. The configurations presented are three crew members, side-by-side in the tank hull; two crew members, side-by-side in the tank hull; and two crew members, segregated from one another in the tank hull. These specifications provide examples of the level of systems functionality and design guidelines necessary for the simulator programmers/developers to build a product to support human performance and training research in the CCTB environment.

RP 93-06 A Concept Formulation Process Aid for Trade-Off Determination: User's Guide, Elder, B.L.; Sticha, P.J.; Page, G.L.; Singer, M.J. March 1993. (AD A264 173)

This report provides information for users of the prototype concept formula-

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tion process aid (CFP-Aid). The CFP-Aid addresses the trade-off determination phase of the concept formulation process as practiced by the Engineering Division of the Simulation, Training, and Instrumentation Command (formerly Project Manager for Training Devices). This report briefly presents the goals and development of the system. It provides information on installation of the system and supporting software, execution of the program, and potential user interaction. The major sections of the report explain system operations and individual module functions. The report also provides details on each individual screen and all menus presented by the system and includes guidance about the use of the system in analyzing training requirements.

RP 93-07 A Concept Formulation Process Aid for Trade-Off Determination: Operators Guide, Page, G.L.; Blacksten, H.R.; Elder, B.L.; Sticha, P.J.; Singer, M.J. March 1993. (AD A263 756) This report describes the structure of the prototype concept formulation process aid for trade-off determination. The goal was to adapt previously developed models for use during a specific step in the development of a training device. This report identifies the hardware requirements and the necessary configuration and describes the installation procedures. A brief overview of the aiding system execution and use is presented. The report also describes the structure and function of the program files. The data elements, links between elements, and aiding functions are described in the context of the program routines.

RP 93-08 Performance Measures for Simulation, Elliott, G.S.; Quinkert, K.A. June 1993. (AD A267 837) The Close Combat Test Bed (CCTB) provides an environment where future armor combat systems can be simulated and evaluated. This research product lists and explains the baseline system performance measures developed from

previous CCTB studies. The six baseline system performance categories are mission performance, information acquisition and communication, tactical assessment and planning, operational control of unit, unit positioning and navigation, and target acquisition and engagement. This catalog of performance measures will be updated every 2 years as more research is conducted.

RP 93-09 Canceled.

RP 93-10 Longitudinal Research on Officer Careers, Volume 1: Technical Manual for 1988-1992 Surveys, Harris, B.C.; Wochinger, K.; Schwartz, J.P.; Parham, L. September 1993. (AD A273 187) The technical manual (Volume 1) and the codebooks published separately as volumes 2 to 5 provide information on the Longitudinal Research on Officer Careers (LROC) survey conducted annually from 1988 through 1992. Approximately 5,000 company-grade officers commissioned from 1980 through 1990 responded to each survey; a total of 928 officers responded to all four surveys. The technical manual provides the sampling plan and tables on the population, sample, respondents, and response rates, as well as a description of the survey and databases. The codebooks provide descriptive statistics for each question in the survey, the survey booklet, and a cross-reference of questions across the 4 years. Others in this series are Volumes 2 through 5--Research Note 93-21A, Longitudinal Research on Officer Careers: Volume 2. Codebook for the 1988 Survey; Research Note 93-21B, Longitudinal Research on Officer Careers: Volume 3, Codebook for the 1989 Survey; Research Note 93-21C, Longitudinal Research on Officer Careers: Volume 4. Codebook for the 1990 Survey; Research Note 93-21D, Longitudinal Research on Officer Careers: Volume 5. Codebook for the 1992 Survey.

RP 94-01 Simulation Networking/Training Requirements Relational Database: User's Guide, Meliza, L.L. November 1993. (AD A275 634)

The Simulation Networking/Training Requirements Relational Database was developed to support analyses and training research projects for applying networked simulators to collective training. The collective tasks, subtasks, and standards described in armor platoon-, company team-, and battalion task force-level Mission Training Plan (MTP) documents form the core of the database. This core is supplemented with three types of data on each of over five thousand collective performance standards. The first type of data rates the extent to which the unit can perform the activities associated with each standard in the current simulation networking (SIMNET) environment. The second type of data provides information on how each of 41 potential enhancements to SIMNET would change the extent to which units can perform activities associated with each standard. This type of data ensures the utility of the database as new generations of network simulators are fielded. The third type of data identifies the source or sources of the data required to assess whether a unit meets performance standards in the networked simulator training environment. These data sources include data broadcast over the simulation network, unit plans for performing the mission, terrain data, tactical communications, and direct observation of behavior. The contents of the database can be exported to any database management system capable of loading ASCII files. Potential applications of this database include estimating the benefits of adding specific enhancements or combinations of enhancements to existing networked simulators; developing and applying measures of collective performance; and describing the behavioral requirements for Semi-Automated Forces (SAFOR).

RP 94-02 The Commander's Battle Staff Handbook: An Introduction to Staff Functional Area Duties for New Battalion Staff Officers, Pleban, R.J.; Thompson, T.J.; Valentine, P.J. December 1993. (AD A276 139)

This report describes the development and evaluation of the (battalion) Commander's Battle Staff Handbook. The handbook provides a quick-fix familiarization for each staff functional area. Relevant doctrine and a realistic job preview are incorporated with reference material to allow an officer to get started as a staff member. Checklists are presented to guide the expectations of each staff member and to assist them in determining the information they need from their battalion commander and from each other to accomplish mission planning, preparation, and execution. Draft versions of the handbook were provided to 185 soldiers serving in combat arms, combat service support, and National Guard units and to military planners and observer controllers from the Joint Readiness Training Center and the National Training Center. Survey findings indicate that the handbook was well received by the respondents. Staff members who used the handbook to prepare for combat training center rotation found it to be a useful guide for staff actions in both the field and the garrison. They also felt that the handbook was a valuable tool to inform the individual staff member of his responsibilities and duties. Most important, they felt that it helped them do their jobs more effectively. The handbook was perceived by all respondents as an effective aid in enhancing their understanding of the synchronization of duties and responsibilities among the battalion commander and the staff. The handbook represents a partial but critical solution to a gap that exists between institutional and unit training and in officer preparation for staff assignments. It is an effective tool that supports battalion commanders' staff training programs and enhances unit combat readiness.

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RP 94-03 Case-Based Expert Systems for Combat Performance Analysis,

Mirabella, A. January 1994. (AD A285 757) This research was part of a larger program to develop methods for selecting brigade training strategies. An essential step in the program was to define performance measures to assess the impact of alternative strategies. Case-based expert system (CBES) technology can help do so. This research product demonstrates how to use CBES to better understand relationships among process and outcome variables. CBES use is described in a step-by-step application to sample data.

RP 94-04 Canceled.

RP 94-05 Evaluation of the Airland Battle Management Advanced

Technology Demonstration Prototype Version 1.2: Knowledge Base Assessment of Location Analysis Applications, McKeown, P.E. March 1994. (AD A280 366) This report documents subject matter experts' assessments of the usability of the Location Analysis Applications (LAAs), a module of the AirLand Battle Management (ALBM) Advanced Technology Demonstration (ATD) decision aid prototype version 1.2. This is one of a series of assessments of the ALBM ATD prototype conducted during its development. The LAAs include 19 automated terrain analysis applications to assist in the analysis of the area of operations for Army division-level tactical planning. Four applications were rated highly or rather usable and 4 were rated as unusable, with the remaining 11 falling between rather usable and somewhat unusable. Specific recommendations for improvements are provided.

RP 94-06 Evaluation of the Airland Battle Management Advanced

Technology Demonstration Prototype Version 1.2: Human Factors Assessment of the Soldier Machine Interface, Rap-

pold, V.A.; Flanagan, J.P. April 1994. (AD A280 316) This report documents the results of an early human factors assessment of the Soldier Machine Interface of the AirLand Battle Management (ALBM) Advanced Technology Demonstration (ATD) decision aid prototype, version 1.2. This is one of a series of assessments of the ALBM ATD prototype conducted during its development. An assessment instrument was developed to evaluate compliance to several sources of interface design guidelines and principles, both military and nonmilitary. Using the assessment instrument, a human factors specialist collected evaluation data. In addition to specific recommendations for interface improvement, suggestions are made for improved interface development procedures.

RP 94-07 Evaluation of the Airland Battle Management Advanced

Technology Demonstration Prototype Version 1.2: Knowledge Base Assessment of the Avenue of Approach Generation Tool, McKeown, P.E. April 1994. (AD A280-241) This report documents subject matter experts' (SMEs) assessments of the knowledge base of the Avenue of Approach (AA) Generation Tool, a module of the AirLand Battle Management (ALBM) Advanced Technology Demonstration (ATD) decision aid prototype, version 1.2. This is one of a series of assessments of the ALBM ATD prototype conducted during its development. The AA Generation Tool will generate an AA given an initial location, objective, and force template. It uses terrain data obtained from the Tactical Decision Aids terrain data base in generating the AA. In general, SMEs thought that the concept for automatic AA generation was good, but the current implementation was of marginal use. Specific recommendations for improvement are provided.

RP 94-08 Evaluation of the AirLand Battle Management Advanced

Technology Demonstration Prototype Version 1.2: Review of the Trend Analysis and Projection Tool, Flanagan, J.P. April 1994. (AD A280 431) This report documents observations of acceptability of the procedures and algorithms of the Unit Status Projection and Trend Analysis Tool (USP/TA), a module of the AirLand Battle Management (ALBM) Advanced Technology Demonstration (ATD) decision aid prototype, version 1.2. This is one of a series of assessments of the ALBM ATD prototype conducted during its development. Because little documentation was made available, the assessment was limited to observations made by an analyst working with the Tool. The USP/TA tool provides Army division planners with current and projected unit status information and Force Ratios. Review of the Tool suggests that algorithms supporting resource projections are not adequate for the projection task. Army Field Manual (101-IO-1/2) tables used to project status do not, in many cases, have the type of data necessary to support the calculations. The authors recommend that improved algorithms and procedures be developed and validated before proceeding with development.

RP 94-09 Evaluation of the Airland Battle Management Advanced Technology Demonstration Prototype Version 1.2: Knowledge Base Assessment of the Avenue of Approach Comparison Tool, Riedel, S.L.; McKeown, P.E.; Flanagan, J.P.; Adelman, L. April 1994. (AD A280 367) This report documents subject matter experts' (SMEs) assessments of the knowledge base of the Avenue of Approach Comparison Tool (AACT), a module of the AirLand Battle Management (ALBM) Advanced Technology Demonstration (ATD) decision aid prototype, version 1.2. This is one of a series of assessments of the ALBM ATD prototype conducted during its development. AACT analyzes and rank orders automatically or manually generated Avenues of Approach (AAs) for tactical

planning. It rank orders the AAs using a Multi-Attribute Utility Analysis approach and an automated terrain data base. SMEs judged the AACT ability to query the automated terrain data base for terrain data to be very useful. However, the underlying procedures and analysis factors, as they are at this time, may not yield acceptable results. Suggestions for improvement are provided.

RP 94-10 An Annotated Bibliography on Second Language Acquisition, Alderks, C.E. June 1994. (AD A282 713) This report summarizes representative literature in second language acquisition and learning. Writings by the major theorists and researchers were abstracted. These writings were categorized by topic: Testing/Evaluation, Feedback, Inter-language, General Language Research Issues, Instruction vs. Natural Learning, Acquisition/Order and Acquisition, Personal Factors, Attrition, Strategies and Styles of Learning, Theory, and Computerized Learning. Summaries of the articles are provided.

RP 94-11 Canceled.

RP 94-12 Catalog of Training Tools for Use in Distributed Interactive Simulation (DIS) Environments, Atwood, N.K.; Winsch, B.J.; Quinkert, K.A.; Heiden, C.K. June 1994. (AD A282 841) This report is a catalog of training tools for use in Distributed Interactive Simulation (DIS) environments. It is intended as a reference document for users of DIS facilities and for planners of new simulation-based training facilities. The report describes the background and context in which these training tools were developed, and the capabilities and applications of tools developed to enhance simulation-based training in three functional areas. These areas include (a) techniques for structuring simulation-based exercises, (b) strategies for eliciting and capturing command, control, and commu-

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nifications (C3) performance, and (c) approaches for demonstration, presentation, and analysis.

RP 94-13 Micro Computer Feedback Report for the Strategic Leader Development Inventory, Hopkins, J.E.

July 1994. (AD A283 540) In 1990, the U.S. Army War College (USAWC) saw the need for a tool to provide leadership developmental feedback to incoming students as an aid to their planning for the resident year and progress following that year. The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) developed and pilot tested the Strategic Leader Development Inventory (SLDI) to satisfy that need. As a part of the concept, an automated feedback printing program was developed to enable user organizations to print graphic feedback that facilitates student interpretation of SLDI scale scores. That program was developed for the academic year 91-92 pilot test and was revised for the academic year 92-93 field test of the SLDI. The academic year 92-93 version of the FeedBack program produced reports for a fixed set of questions and evaluation factors. If any changes were made in the SLDI, the program had to be re-written. The academic year 93-94 upgraded version of the FeedBack program is flexible. It allows the survey questions and the evaluation factors to be redefined through the use of a look-up table, thereby enabling continuous user product improvement over time and adaptation of the SLDI to different subject populations as needed. The FeedBack program requires an MS DOS or a compatible computer connected to a Hewlett Packard LaserJet or compatible printer. The source code for this program is published separately as a Research Note.

RP 94-14 FY89-92 Special Forces Qualification Course Longitudinal Database: Technical Manual and Codebook, Diana, M.; Teplitzky, M.L.; Zazanis, M.M.

July 1994. (AD A284 272) This report describes the development and contents of the FY89-92 Special Forces Qualification Course (SFQC) Longitudinal Database. The database was constructed from the FY89-92 SFQC Class Database, which in turn was based on administrative databases, class rosters, and Army Training Requirements and Resources System (ATRRS) files provided by the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). Variables include basic demographics, final training outcomes, and performance on the SFQC land navigation field exam. The longitudinal structure of the database allows researchers to track students over time and across classes. Records for over 4,000 SFQC students from 148 different SFQC classes are included in the database. The database was developed to answer questions of immediate practical importance to the sponsor (USAJFKSWCS) and to support the U.S. Army Research Institute's long-term Special Forces research program.

RP 94-15 FY89-92 Special Forces Qualification Course Class Database: Technical Manual and Codebook, Zazanis, M.M.; Diana, M.; Teplitzky, M.L. July 1994. (AD A284 273)

This report describes the development and contents of the FY89-92 Special Forces Qualification Course (SFQC) Class Database. The information in the database was extracted from Army Training Requirements and Resources System (ATRRS) files for SFQC classes in FY89, FY90, and FY91. Data for FY92 were obtained from the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS) Academic Records office. Variables include basic demographics, final training outcomes, and land navigation performance. The Class Database is organized by SFQC Military Occupational Specialty (MOS) and class. This database is useful if the user's objective is to analyze data within or across classes. It also provided the basis for the longitudinal database, designed to track students over time and

across classes. The database was developed to answer questions of immediate practical importance to the sponsor (USAJFKSWCS) and to support the U.S. Army Research Institute's long-term Special Forces research program.

RP 94-16 Innovative Training Concepts for Use in Distributed Interactive Simulation (DIS) Environments, Winsch, B.J.; Atwood, N.K.; Sawyer, A.R.; Quinkert, K.A.; Heiden, C.K.; Smith, P.G.; Swartz, J.P. August 1994. (AD A285 585) This report describes innovative approaches for conducting training using emerging simulation technology. It is intended as a forward-looking reference for training developers and

trainers interested in conducting specific types of training exercises using Distributed Interactive Simulation (DIS). The report presents five innovative training concepts that can be structured within a DIS environment for delivery of five types of training exercises, including (a) a Battle Staff Planning Exercise, (b) a Leader's Reconnaissance Exercise, (c) a Mission Rehearsal Exercise (Electronic Sand-table), (d) a Mission Execution Exercise (Electronic Sandbox), and (e) an Information Management Exercise. The report concludes with a description of the implementation of one of these five concepts, an Information Management Exercise (IMEX).

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RR 1543 Organization of Technical Information for Electronic Delivery

Mears, J.E.; Braby, R.; Hebert, J.; Babu, A.J.G.; Kincaid, J.P.; Meliza, L.L. October 1989. (AD A217 641) The U.S. Army is preparing to make the transition to electronic technical manuals. The objectives of this effort were to design, create, and demonstrate formats for displaying technical information on microcomputer screens. These formats were to take maximum advantage of the display and interaction capabilities that set computers apart from the paper media generally used for this type of information. In addition, the formats were to be economical to produce, store, retrieve, and display. The resulting formats are in the form of job performance aids and procedure simulations. Job performance aid display algorithms retrieve text and graphic data elements from data files and display the data in different formats for technicians of differing skill levels. Depending upon information needs, the technician can review written descriptions of task steps, call up static graphics and animated graphics to clarify procedural text, call up locator graphics to help locate a particular item of equipment in the context of a larger system, and/or call up detailed descriptions of task steps that are so complex that they warrant being addressed as a task in their own right. Formats for "smart" display frames used in procedure simulations include "locator screens," which can be used to train a technician to identify equipment components, and "action screens," which can be used to train a technician to check/operate equipment. The job performance aid and procedure simulation formats were demonstrated through development of two rudimentary information delivery and authoring software programs. Army organizations expressed interest in using the software as a research tool. The government developed user's guides for the software, assessed the extent to which the software was user-

friendly, and identified issues for future research.

RR 1544 Mediating Stress in Army Training: The Trainer Is the Critical Component

Thompson, T.J. November 1989. (AD A218 554) Experimentally-based literature exists that has direct relevance to stress mediation and management in Army training. The contribution of stressors to risk in training can be removed or mediated with proper programs and instructor preparation. Confident and skilled instructors and supporting command leadership are critical to training. They must not be overstressed in order to serve as functional role models for those they are training. Command awareness and involvement in training are necessary to reduce unwanted stress in the training environment.

RR 1545 Soldier Performance as a Function of Stress and Load: A Review

Buckalew, L.W. January 1990. (AD A221 530) This report describes the results of a survey to identify and summarize literature related to soldier performance when under stress, with an emphasis on the relationship of stress to the combat load of the individual soldier. Researchers used a number of different databases to conduct a computer search (DIALOG) of professional and military literature on stress. Results of the effort indicate that the majority of the empirical data on stress from within the scientific community is difficult to extrapolate to military combat situations. Conversely, the majority of stress-related data from combat situations is anecdotal. The most representative stress-related research appears in studies of sustained or continuous operations. The report concludes that stresses typical of those to which the soldier is exposed in combat result in a degradation of cognitive performance, motor skills, and load-bearing capability. In turn, excessive

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soldier loads may contribute to stress. Stressors that were treated most thoroughly in the literature were fear, fatigue, uncertainty, sleep deprivation, work and rest cycles, and ambient temperature. The report includes recommendations for maximizing soldier performance in stressful situations.

RR 1546 MANPRINT Evaluation of the High Mobility Multipurpose Wheeled Vehicle Heavy Variant, Krohn, D.A.; Spiegel, D.K. February 1990. (AD A220 025) This report presents the results of a MANPRINT (Manpower and Personnel Integration) evaluation of the High Mobility Multipurpose Wheeled Vehicle—Heavy Variant (HMMWV-HV). The evaluation was conducted by the Army Research Institute for the Behavioral and Social Sciences in conjunction with operational assessment of the HMMWV-HV by the U.S. Army Operational Test and Evaluation Agency (OTEA). Three configurations were examined: the maxi-ambulance, the mini-ambulance, and the S-250 communications shelter. Realistic missions were simulated in a field setting over a variety of terrains, and critical incidents and system operations problems were recorded as they occurred. These data were supplemented with interview and questionnaire data. Fifty-eight areas in which system improvements may be warranted are identified. Nine of the areas involve training; five involve maintenance; 20 involve human factors and operations; and 24 involve systems safety and health hazards.

RR 1547 Strategies for Training Reservists With a Hand-Held Tutor, Shlechter, T.M. February 1990. (AD A219 899) The purpose of this research was to (a) assess the effectiveness of the Hand-Held Tutor (HHT) for training fire commands to Reserve Component (RC) units; (b) compare the relative instructional effectiveness of small group and individualized presentation of the HHT materials; and (c) examine the impor-

tance of discussion of the instructional materials. Eighty-five soldiers from various RC units in Kentucky participated in the experiment. The experimental design was a 2 X 4 factorial for repeated measures. The factors were two levels of testing (pretest and posttest), which were repeated for all soldiers, and four different training conditions ("GRP," "DISC," "NON-DISC" and "IND"). The soldiers' mean scores on the performance and confidence measures increased from the pretest to the posttest assessments. The GRP training soldiers took less time to complete the instructional materials and made more correct responses to the embedded pretest items than did the soldiers in the other training conditions. This experiment's findings suggest that the HHT instructional program *M1 Degrade Mode Gunnery and Multiple Return Strategies*, should be implemented at RC units.

RR 1548 The 1989 ARI Recruit Experience Tracking Survey: Technical Manual/ Codebook, Benedict, M.E. February 1990. (AD A220 024) This is one of two reports produced to document the 1989 Army Research Institute for the Behavioral and Social Sciences Recruit Experience Tracking Survey (RETS). RETS is a longitudinal survey of 1986 and 1987 New Recruit Survey respondents who were originally questioned at the eight U.S. Army reception battalions during their first 3 days on active duty. This volume describes the project background, instrument development and content, sample design, survey administration, database development, and documentation. Technical Appendixes include a codebook index, example of a codebook page, survey codebook, copy of the RETS survey instrument, and copies of letters sent to survey respondents.

RR 1549 Development of a Peer Comparison Procedure for the U.S. Army Aviation Officer Advanced Course, McAnulty, D.M. February 1990. (AD A219

898) In response to a request from the School Secretary, U.S. Army Aviation Center, Fort Rucker, Alabama, a peer comparison (PC) procedure was developed to select Aviation Officer Advanced Course (AVNOAC) honor graduates on the basis of a "whole person" concept. Under this concept, students would be evaluated on and honored for both their academic performance and for other attributes important in the development of an Army aviation officer. The PC procedure is a combination of the peer nomination and peer ranking methods and the psychophysical scaling technique of paired comparisons. Section members in each AVNOAC class nominate and rank order five of their peers on their potential as aviation officers. They then compare each pair of nominees on each of five military qualities identified by senior aviation officers as important and likely to be observed in the course. The PC procedure was administered twice in each of two AVNOAC classes ($N = 90$ and 103). The results indicate that the procedure is easy to use, has high internal consistency and temporal stability, and produces a consensus on which students have the highest potential.

RR 1550 Doing Deception: Attacking the Enemy's Decision Processes,

Hicinbothom, J.H.; Zachary, W.W.; Knapp, B.G.; Zaklad, A.L.; Bittner, A.C., Jr.; Broz, A.L. February 1990. (AD A221 529) This report examines military deception from the point of view of the battlefield deception planner. Tactical decision cycles are surveyed and basic concepts for deceiving them are presented. These concepts are applied to the deception planning process, resulting in an enhanced planning process that builds upon current doctrine. Tactical examples are offered to illustrate this approach.

RR 1551 A Comparative Overview of OPFOR and FFOR Decision Cycles for Battlefield Deception Planning, Moan, K.L.; Broz, A.L.; Zaklad, A.L.; Bulger, J.P.;

Hicinbothom, J.H.; Knapp, B.G. February 1990. (AD A221 199) This report reviews available open-source literature on U.S. Army and Soviet style tactical operations. Findings have been synthesized to provide battlefield deception planners with an overview of decision cycles and information flow processes used by these respective military organizations. The report includes a section comparing differences between US operations planning and Soviet troop control at the tactical level from an information processing perspective. Implications for use of this type of knowledge for battlefield deception planning are suggested.

RR 1552 Sampling the Threat Domain for Efficient Tank Gunnery

Training and Testing, Campbell, C.H.; Hoffman, R.G. February 1990. (AD A220 612) This research proposes methods for specifying realistic threat-based conditions under which to conduct training and testing. Selection of conditions for training focused on the Mission Essential Task List (METL). Platoon, crew, and individual tasks were included. The procedure was designed to be sensitive to differences in initial task proficiency and difficulty in the importance of tasks depending on the unit's METL. To develop methods, researchers constructed an algorithm to estimate potential proficiency gains for platoon, crew, and individual tasks that could occur from practicing each of the threat engagements. The algorithm is iterative; on each iteration it selects the engagement that is predicted to provide the maximum payoff in total expected proficiency gain weighted by importance. Subsequent iterations recalculate expected proficiency gains to adjust for the gain expected from the engagements already selected. Thus, the algorithm identifies the rank order of engagements for maximizing proficiency gains on important and poorly performed tasks. The algorithm was implemented in a BASIC computer program. Additional support programs were written to input and update changes in

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tasks and engagements. The BASIC program should allow unit commanders to rapidly determine which threat-based engagements to use to provide the most beneficial context for training gunnery most closely related to their METL. The algorithm provides a method for guiding research related to particular kinds of gunnery tasks by identifying threat conditions that require those tasks. Selection of engagements for testing focuses on crew and platoon subtasks. Engagements are clustered on the basis of their coverage of subtasks. The method comprises decision points in which test constraints are specified that impinge on implementation of engagement conditions and steps that ensure complete coverage of all subtasks.

RR 1553 Operator Performance Enhancement for the Guard-rail/Common Sensor System 5, Hall, M.J. February 1990. (AD A221 389) The Communications and Electronics Command (CE-COM) Center for Electronic Warfare/Reconnaissance, Surveillance, and Target Acquisition (EW/RISTA) requested the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to identify Guard-rail operator requirements and identify uses for advanced technology that would enhance operator performance. Analytical functions within the Integrated Ground Processing Facility were identified and workload assessments and observations of operator performance were made. It was found that, while workload demands were not excessively high, advanced technology is needed for functions requiring analytic and foreign language skills. Recommendations were made for job aid support to operators.

RR 1554 Attrition in Military Intelligence Interrogator Training: Identification of Possible Causes, Burnstein, D.D.; Hopson, J.A. March 1990. (AD A221 288) Research was conducted to de-

termine the factors that contributed to more than 20% attrition in the 97E10 interrogator course. It was found that native linguists were attriting at a higher than expected rate. Also, academic attrition stemmed primarily from four special subject matter areas. Researchers concluded that attrition of native linguists can be reduced by raising the cutoff scores used in initial screening or providing the native linguists with more individual assistance. Academic attrition can be reduced by improving the instructional technology in the problem subject matter areas.

RR 1555 Spouse Employment in the Army: Research Findings, Scarville, J. March 1990. (AD A222 135) This report reviews what is known about Army spouse employment as a result of the Army Family Research Program (AFRP). The analyses reported apply primarily to civilian wives because they constitute the majority of Army spouses. The findings indicate that, although Army wives are entering the labor force in increasing numbers, their labor force participation lags slightly behind that of civilian wives. In addition, unemployment is considerably higher among Army wives (especially among wives of junior enlisted personnel) than among civilian wives, and there is ample evidence of underemployment. Aspects of the Army lifestyle such as employment interruptions because of frequent relocations seem to have pervasive effects on wives' labor participation and employment. Other structural/institutional barriers such as inadequate transportation and child care also pose obstacles for military spouses. In addition, AFRP analyses show that Army wives' employment circumstances have important implications for military retention and are likely to influence readiness.

RR 1556 Family Impacts on the Retention of Military Personnel, Orthner, D.K. April 1990. (AD A225 084) This re-

search supports *The Family Action Plans* (1984-1989) by providing new information on the retention decision to military leaders and policymakers and generating hypotheses to be evaluated in the Army Family Research Program (AFRP). Findings were summarized from the different AFRP investigations, which consisted of (1) extensive reviews of military and civilian family and retention literature; (2) secondary analyses of the 1985 DoD Soldier and Spouse Surveys and the 1983 One Thousand Families in Europe Survey; (3) primary analysis of the 1988 Annual Survey of Army Families; and (4) new data collected on Army single parents, dual-military couples, and other Army families in the United States and Europe. Family factors contributing to retention decisions include spouse support for the military member, spouse employment, family life cycle, family economics, and the family career decision process. Policymakers and Army commanders can use the findings in this report to guide their decisions concerning the family programs most likely to enhance retention. This report will also be of value in deriving hypotheses for the Army Family Research Program.

RR 1557 Computerized Hand-held Instructional Prototype (CHIP): Final Report, Holland, M.; Wisher, R. May 1990. (AD A226 450) This report describes the development and evaluation of the computerized Hand-held Instructional Prototype (CHIP). CHIP is a self-contained and fully portable, battery-operated training device small and light enough to be hand-held during operation. The report describes the CHIP and its software, and summarizes five applications in the Army, Navy, and Air Force. CHIP produces the best results when used as a voluntary trainer to supplement lectures and practical exercises outside the classroom. Recommendations for the use of CHIP in schoolhouse exercises and in the field are included.

RR 1558 The Role of Installation Leaders in Creating a Supportive Family Environment, Blankinship, D.A. May 1990. (AD A223 799) The Army has a long-standing interest in the welfare of soldiers and their families. A soldier's family affects his or her readiness and influences his decision to become a career soldier. The Army Family Research Program (AFRP) has found that a soldier's satisfaction with an installation's family environment correlates with his or her satisfaction with the military way of life. This report presents results obtained from an investigation of the role of installation level leadership in creating supportive environments for Army families. Researchers visited eight Army installations and interviewed a total of 21 senior leaders, 78 service providers, and 323 Army family members. The researchers used interview guides, focus group guides, and a short questionnaire to collect leadership practices information. The results of this research suggest the need for routine communication between families and installation leaders and the need to monitor family-related benefits. If the Army wants supportive families, it must train them in the use of communication channels. This training should include how to use the various processes as well as what to expect from having used a process. Leaders need feedback loops that work. When a leader sets up a family benefit (e.g., "Family Time," or a new child care facility), the leader needs to monitor the benefit to see if it is effective. Enhancing communication will benefit leaders, families, and the Army.

RR 1559 Family Adaptation in the Military, Orthner, D.K.; Bowen, G.L. May 1990. (AD A225 085) This research supports *The Family Action Plans* (1984-1989) by providing new information on family adaptation to military leaders and policymakers and generating hypotheses to be evaluated in the Army Family Research Program (AFRP). Findings were summarized for the different

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AFRP investigations, which included research and literature reviews, model development, primary and secondary analysis of available data sets, consultations, and field interviews. Indicators of family adaptation are found to vary by individual, family, work, and community characteristics such as informal support networks, military support services, and military leadership support.

RR 1560 Tank Gunnery: Transfer of Training from TopGun to the Conduct-of-Fire Trainer, Hart, R.J.; Hagan, J.D.; Bowne, D.S. May 1990. (AD A223 165) This research examined the effect of TopGun training on main gun M60A3 tank gunnery performance as measured on the Conduct-of-Fire Trainer (COFT). Three groups of 16 Reserve Component (RC) soldiers were compared using a transfer-of-training design. Firing under auxiliary sighting conditions, the groups differed on the number of TopGun training sessions (0,1,or3) they had before completing a testing session on COFT. Results showed that gunnery speed and accuracy on stationary and moving targets improved during TopGun training and that prior training on TopGun improved subsequent performance on COFT in terms of increased accuracy on stationary target engagements. TopGun performance was also found to be a reliable predictor of COFT performance, with greater correlations found for speed than for accuracy. This report outlines a TopGun-based training strategy for increasing the probability of positive transfers moving targets, as well as to stationary targets, and for enhancing the overall payoff obtained from TopGun training within the RC.

RR 1561 Transfer-of-Training Study of Emergency Touchdown Maneuvers in the AH-1 Flight and Weapons Simulator, Kaempf, G.L.; Blackwell, N.J. June 1990. (AD A226 360) For this report, researchers conducted a transfer-of-training

study to investigate the effectiveness of the AH-1 and Weapons Simulator (FWS) as a training device for the reacquisition of skills on five emergency touchdown maneuvers (ETMs). Twenty aviators assigned to operational aviation units served as subjects. All aviators received initial checkrides in the aircraft and the FWS and were assigned to one of two groups on the basis of their checkride scores. The control group ($n=10$) received training to proficiency in the aircraft on each of the five maneuvers and a second checkride in the FWS. The experimental group ($n=10$) received training proficiency in the FWS on each of the five maneuvers followed by similar training in the aircraft. Analysis of the initial checkride scores indicated that the aviators' skills were deficient on the ETMs prior to the study. They required extensive training to reach proficiency in the FWS but relatively little training to regain proficiency in the aircraft. Prior training in the FWS reduced the number of practice trials and the amount of flight training time required to reach proficiency in the aircraft. However, training in the existing FWS alone is insufficient for reacquisition of ETM skills to a standard of aircraft proficiency. In view of the prohibition on practice of ETMs in the aircraft, it is recommended that the Army initiate a product improvement program for the FWS.

RR 1562 Training Effectiveness Evaluation of the Squad Engagement Training System (SETS), Easley, M.E.; Hagan, J.D.; Ashworth, R.L.; Viner, M.P. June 1990. (AD 226 406) For this report, researchers worked to determine (a) whether the Squad Engagement Training System (SETS) can be used to enhance squad-level tactical proficiency, (b) the relationship between SETS-based and range-based marksmanship qualification scores, and (c) soldier perceptions of SETS-based training. Nine infantry and nine support squads from the Oregon Army National Guard (ORARNG) were as-

signed randomly to experimental and control groups. Experimental group squads received 2 hours of SETS-based training that included firing for record on a simulated 25-m alternate qualification course and participating in two tactical training exercises conducted as part of a simulated company defense. They then proceeded to zero their weapons, participate in two tactical evaluation exercises on a squad live-fire range (SLFR), fire for record on a 25-m alternate qualification course, and fill out a questionnaire pertaining to their SETS-based training experience. Control group squads did not receive initial SETS-based training, but proceeded directly to zero their weapons, complete the SLFR tactical exercises, and fire for record. Squad leaders in both groups were evaluated at the SLFR on 27 subtasks selected from the tactical tasks of Prepare for Combat, Defend, and Consolidate/Reorganize. Overall squad performance on the SLFR was measured in terms of fire distribution (i.e., the number of targets hit/the number of rounds fired). With respect to tactics, squad leaders and squad members performed better on the SLFR if they had prior SETS-based training, i.e., positive transfer. Tactical subtask scores for experimental group squad leaders improved during SETS-based training and carried over to the SLFR, where experimental group squad leaders outperformed control group squad leaders, with differences particularly evident among the leaders of support squads. Squad members also displayed better fire distribution scores on the SLFR after SETS-based training. This was especially true for support squads in the experimental group. The correlation between SETS-based and range-based marksmanship qualification scores was statistically significant but not high enough to support accurate prediction of range-based scores from SETS-based scores. Lastly, soldiers indicated that they enjoyed training on SETS and felt that it would be a valuable device for home-station training. These results attest to sets' potential to sup-

port training of stationary squad-level defensive tactical skills required of Active and Reserve Component units. In particular, SETS could provide Reserve Component soldiers with an opportunity for the kind of realistic engagement of opposing forces (OPFOR) that is necessary for training and maintaining small-unit defensive tactics but difficult to furnish at home station. In regard to marksmanship, the results of this evaluation would not support a recommendation to use SETS-based scores in place of range-based scores for purposes of record-fire qualification.

RR 1563 Train the Trainer to Train: Dragon Instructor Certification, Lucariello, G.; Dyer, J.L. June 1990. (AD A226 445) The purpose of the research was to develop and evaluate a certification program for Dragon instructors. Certification materials that focused on instructors' ability to convey task content, and to identify, diagnose, and correct student errors were developed. Baseline measures of student performance and instructor behavior were obtained before the certification program was started. The same measures were obtained after instructors participated in the program. Positive changes in student behavior occurred on three of the five Dragon tasks included in the certification program. No changes occurred on the Dragon tasks that served as controls. However, both the experimental and control tasks tested for retention 1 month after the Dragon course were forgotten quickly. Desired changes in instructor behavior were more likely on the experimental tasks than on control tasks. Correlations showed a relationship between indexes of instructor quality and student performance. Results showed that a certification program can be used to enhance the skills of instructors and to select instructors.

RR 1564 Unit Leader of Assessments of a Joint Readiness Training Center Rotation, Julien, T.D.; Siebold, G.L.

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June 1990. (AD A226 317) For this research, leaders from a battalion that had completed a rotation through the Joint Readiness Training Center (JRTC) 3 weeks earlier were given a questionnaire and /or were interviewed. They responded that training at the JRTC was realistic and somewhat stressful and that JRTC after-action reviews were useful. The capabilities most important for platoon leaders at the JRTC were technical and tactical proficiency, initiative, and decision making; those for company commanders were planning, decision making, and communication. Platoon cohesion correlated significantly with perceived platoon performance ($r=.40$). The leaders provided many suggestions on how to train for a JRTC rotation.

RR 1565 Assessing the Capabilities of Training Simulations: A Method and Simulation Networking (SIMNET) Application, Burnside, B.L. June 1990. (AD A226 354) A rule-based method was developed for assessing Army Training and Evaluation Program Mission Training Plan (ARTEP MTP) standards that can be met and subtasks and tasks that can be performed in training devices and simulations. The method was applied to assess the performance capabilities of the Simulation Networking (SIM-NET) system. Extensions of the method were examined for identifying enhancements and performance measures needed for training simulations. Results indicated that the method provides an efficient means to assess the capabilities and requirements of devices and simulations. It can be used to identify key tasks for training effectiveness and transfer research, and to assess the effects of system enhancements in terms of the additional tasks that can be trained.

RR 1566 A Design Architecture for an Integrated Training System Design Support System, Hinton, W.M.; Braby, R.; Feuge, R.L.; Stults, A.H.; Evans, S.M.; Gib-

son, M.R.; Zaldo, W.T. July 1990. (AD A225 084) This report presents the results of a systems engineering analysis of the training development process required to produce an Integrated Training System (ITS) for a New Weapons System (NWS). This work was performed in response to the findings of the 1985 Army Science Board and the latest Army Aviation Mission Area Analysis, which suggest that Army training development for NWS can be improved by using a "top-down" approach to training system development starting very early in the NWS acquisition process. The report contains the design architecture for an Army ITS Decision Support System (DSS), portrayed in Information Definition, Mod O (IDEFO) diagrams, plus supporting data on potential users of the system, embedded training, ITS data sources, and a set of training system design elements. The architecture spans the full cycle of NWS development from Milestone O through fielding and long-term maintenance. It integrates all aspects of ITS development within and across Military Occupational Specialties, such as individual, collective, and combined arms training and institutional, unit, and distributed training. The architecture provides the basis for the development of the functional specifications for the DSS. Specific intervention points are identified to provide the focus for future efforts to develop individual methods and procedures that are compatible with the overall model.

RR 1567 The Interdependence of Self-Reported Estimates of Individual and Unit Performance of U.S. Army Junior Officers, Lakhani, H.A. July 1990. (AD A226 447) This report integrates and extends the existing research on individual (Olson and Borman, 1989) and group (Blades, 1986) performance by interrelating self-reported estimates of individual and group (=unit) performance in a system of simultaneous equations. the Blades (1986) model of unit performance was supported and extended by an

analysis of survey data from a sample of 3,422 junior officers. These analyses showed that self-reported estimates of unit performance were related positively with: (i) the self-reported estimate of relative individual performance, (ii) command experience, and (iii) the authoritarian leadership style under which a member functioned. The Olsen-Borman (1989) model of organization and environmental variables was extended by showing that self-reported estimates of relative individual performance were related positively to: (i) the self-reported estimate of unit performance, (ii) absolute individual performance, (iii) individual confidence, and (iv) pride in service. As regards the performance of the two self-reported estimates of performance, the regression weight of the self-reported estimate of individual performance was substantially greater (.37) in the equation predicting the self-reported estimate of unit performance than the regression weight (.06) of the self-reported estimate of unit performance when predicting the self-reported estimate of individual performance equation. In the context of this model specification, it appears that the self-reported estimate of individual performance is more critical in explaining the self-reported estimate of unit performance than conversely.

RR 1568 Women in Combat: An Overview of the Implications for Recruiting, Hay, M.S.; Middlestead, C.G. July 1990. (AD A227 516) This report presents an overview of recruiting issues involved if the combat exclusion policy for women in the U.S. Army is changed. Historically, women have had no explicit combat role, but have often moved into de facto combat roles when circumstances demanded. Eliminating the combat exclusion would change women's role from combatant by chance to combatant by design. Attitude research on military personnel indicates mixed opinions on women in combat; however, national opinion polls and attitude surveys suggest that public approval is in-

creasing. Research indicates several factors related to women's nontraditional occupational choices: commitment to being in the labor force, higher ability, higher educational expectations, and approval by significant others. The cases of Canada and Norway are cited as examples of other countries' experiences in opening combat roles to women. A number of arguments against women in combat are presented, together with favorable views to provide a balanced portrayal of the issues. Research directions are proposed and current survey research is described.

RR 1569 Bradley Fighting Vehicle Gunnery: The Use of the Protective Mask in the Conduct of Fire Trainer, Salter, M.S. July 1990. (AD A226 446) An experiment was designed to reassess requirements for Bradley Fighting Vehicle (BFV) institutional gunnery training. The question of the need to wear the nuclear, biological, chemical (NBC) protective mask while training in the Conduct of Fire Trainer (COFT) gunnery simulator was addressed by an experiment in which experienced Bradley gunners and commanders fired a preselected set of COFT exercises both with and without the mask. Results indicated that on several critical gunnery performance variables, crew performance was significantly slower in the masked condition. The results, while preliminary, indicate that crews must fire wearing the mask whenever possible, in order to overcome possible performance degradation produced by the mask.

RR 1570 Soldier Performance Using a Part-Task Gunnery Device (TOPGUN) and Its Effects on Institutional-Conduct of Fire Trainer (I-COFT) Proficiency, Kraemer, R.E.; Smith, S.E. July 1990. (AD A227 403) The high costs and problems associated with equipment-based training have prompted the use of both high- and low-fidelity devices and simulations

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for tank gunnery training. The utility of the TOPGUN device as a low-fidelity part-task gunnery trainer is examined in three experiments by comparing soldier pretest to posttest performance, as defined by six measures of gunnery accuracy and speed, and increases in TOPGUN and I-COFT tank gunnery device proficiency. The major findings of the research were (a) experienced and inexperienced soldiers learned basic gunnery skills on TOP-GUN; (b) device-based performance improvements were not significantly different using either free-play or structured training for experienced or inexperienced soldiers; (c) gunnery skills by MOS-qualified soldiers improved significantly from pretest to posttest, however, group differences were not detected; and (d) the overall attitude of soldiers who trained on the device was very positive.

RR 1571 Predicting First-Run Gunnery Performance on Tank Table

VIII, Campshire, D.A.; Drucker, E.H. August 1990. (AD A228 201) For this report, research was conducted to determine if performance on the first run of Tank Table VIII can be predicted from amount and level of training on the Unit Conduct-of-Fire Trainer (U-COFT) and from crew turbulence data. During the first phase of the research, intercorrelations were computed between predictor variables and Table VIII performance measures obtained from 77 tank crews. Two predictor variables from U-COFT training correlated significantly with Table VIII performance—crew reticle aim level and TC reticle aim level. Neither variable was able to predict which crews would qualify on Table VIII, but the composite of crew reticle aim and time in crew predicted which crews would qualify. This finding was not supported by the results based on 136 crews examined during Phase II. Since gunnery training was curtailed during Phase I but not during Phase II, the Phase I results may be applicable to future

training situations in which resource constraints curtail training.

RR 1572 The Army College Fund and Military Manpower: A Review of Existing Research, Schmitz, E.J. August 1990. (AD A229 049) The Army College Fund (ACF) is an important enlistment incentive for attracting highly capable individuals to the Army. This report surveys research concerning the Army College Fund and military manpower. Researchers found that (a) the ACF produced significant increases in the number of high-quality enlistments, although there is substantial variation in the specific amount of the increase; (b) no empirical research has been performed on retention effects of educational benefits; (c) limited research has been performed on the projected cost of the ACF program, and these projections also vary considerably. A sensitivity analysis of the cost-effectiveness of ACF as an enlistment incentive was performed by taking high and low estimates of both enlistment effects and program costs. The results indicate that the ACF is as cost-effective an enlistment incentive as enlistment bonuses, and very likely to be a much more efficient market expander.

RR 1573 Analysis of the 1990 ARI Survey of Employers, Schroyer, C.J.; Hansen, L.A.; Lerro, P.A.; Benedict, M.E. September 1990. (AD A228 941) This is one of two reports produced to document the 1990 Army Research Institute Survey of Employers. The Survey of Employers was designed to obtain civilian employers' perceptions of the availability and importance of the skills and abilities that can be acquired by all first-term enlisted soldiers. These data are being used to develop a model of the influence employers' attitudes and practices may have on Army enlistments. Survey questionnaires were mailed to a stratified random sample of 2,145 presidents and chief executive officers of American busi-

nesses. Results indicate that the employers value the attributes that may be acquired by Army veterans and believe veterans possess such skills and abilities. Employers also believe Army veterans possess more of these desired characteristics than job applicants in general. However, there appears to be an overall lack of knowledge among employers as to the educational credentials of today's soldiers. In addition, few employers ascertain the veteran status of new employees, and many do not know if they presently have veterans on their staffs. This volume presents the analyses of those data related to Army advertising policy and transition to reduced military personnel strength.

RR 1574 Concept for a Common Performance Measurement System for Unit Training at the National Training Center (NTC) and With Simulation Networking (SIMNET), Kerins, J.W.; Atwood, N.K.; Root, J.T. September 1990 (AD A230 129) This research was focused on the first objective and presents a concept for the design of a common performance measurement system for unit training at the National Training Center (NTC) and Simulation Networking (SIMNET). Two platoon missions (defense and hasty attack) were used as the vehicle for presenting the concept. The

measurement model established in previous ARI research on unit performance measurement and used to guide the present efforts is a three-part model that recognizes the role of process, outcome, and expert judgment in assessing unit performance. The model provides "bottom line" outcome measure of mission accomplishment derived from the accepted military analysis factors of mission, enemy forces, friendly troops, terrain, and time (METT-T). In addition to METT-T factors, AMTP-based mission-critical tasks have been identified that provide a benchmark for measuring the degree of unit conformity to established tactical doctrine. The concept for a common

performance measurement system (across both NTC and SIMNET training) described herein examines the applicability of the NTC-based model to the SIMNET environment and identifies the boundaries of overlap between the two training settings.

RR 1575 An Annotated Bibliography of the AircREW Selection Literature, Hunter, D.R.; Burke, E.F. September 1990. (AD A230 484) This report summarizes the literature dealing with aircrew selection research conducted through 1989. It includes English language reports available from the open literature and from the United States, United Kingdom, and other armed services. Over 200 studies were identified using computer-assisted and manual searches of the bibliographic data bases and primary and secondary sources. These studies were categorized by selection measure used. Summaries of the studies were provided.

RR 1576 Task Analysis and Workload Prediction Model of the MH-60K Mission and a Comparison With UH-60A Workload Predictions; Volume I: Summary Report, Bierbaum, C.R.; Hamilton, D.B. October 1990. (AD A241 204) A mission scenario was used to conduct a comprehensive task analysis for MH-60K operations. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission. Five phases, 15 segments, 71 functions, and 230 tasks were identified. Researchers identified the crewmember performing each task and derived estimates of the sensory, cognitive, and psychomotor workload associated with each task. Estimates of the task durations also were derived. The mission/task/workload analysis data were used to develop a computer model of workload for MH-60K crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the pro-

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cedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-60K pilot and copilot was compared to the UH-60A baseline workload prediction to determine the impact of the MH-60K advanced technology. The comparison indicated very little difference in the predicted workload for the pilot and indicated a lower predicted workload for the copilot in the MH-60K.

RR 1577 Historical Development of the Estimate of the Situation,

Michel, R.R. October 1990. (AD A230 562) This report traces the development of the U.S. Army's estimate of the situation as described in consecutive editions of the Army Field Manual, FM 101-5, Staff Organization and Operations. Nine editions and one unpublished draft of FM 101-5 were studied, beginning with the first edition published in 1932. The goal was to find out what led to the original form of the estimate and to judge the stability of the estimate across time. In the six topic areas investigated the basic tenets remained remarkable stable. Detail was added to the descriptions of procedures theory 1968, with relatively little detail added in the three subsequent editions. The unpublished 1977 draft of FM 101-5 contains interesting deviations from the basic tenets. These deviations are also discussed.

RR 1578 A Cross-Sectional Comparison of Army Advertising Attributes,

Baker, T.A. November 1990. (AD A233 737) This research examined the advertising attribute items from the New Recruit Survey (NRS), Recruit Experience Tracking Survey (RETS), and the Army Communication Objectives Measurement Survey (ACOMS). The data analyzed were collected from 1986 to 1989. The attribute items asked respondents for

their perceptions of various opportunities offered by the Army. Factor analyses resulted in three factors for the NRS, two for the RETS, and one for six of the eight ACOMS samples. The common factors found related to self-improvement and work/education. Mean comparisons within each survey found that respondents perceived self-improvement attributes and money for education as greater opportunities than aspects of work. Comparisons across surveys found that new soldiers (NRS) perceived greater Army opportunities than experienced than experienced soldiers. Issues concerning inflated expectations of new soldiers, the different frames of reference employed by each sample, and the appropriateness of the items are presented.

RR 1579 Single-Channel Ground and Airborne Radio System (SINCGARS) Operator Training Evaluation,

Palmer, R.L. December 1990. (AD A232 522) The Single-Channel Ground and Airborne Radio System (SINCGARS), which is replacing current Army combat radios, requires much more operator training than the radios. Training evaluation for SINCGARS was performed by the U.S. Army Research Institute using data collected from April to November 1988. Evaluation objectives were to (a) assess training efficiency; (b) relate critical task performance times to Training and Doctrine Command (TRADOC) testing criteria, Armed Services Vocational Aptitude Battery, SINCGARS Learning-Retention Test, class size, student-to-instructor ratio, and student-to-radio ratio; (c) document operator performance deficiencies; (d) document student evaluation of the training; (e) measure operator performance decrement over time; and (f) measure effects of shortening training from 32 to 24 hours. The major findings of the evaluation were the following: (a) 28% of student classroom hours were unrelated to ongoing instruction; idleness increased from 7 to 59% during the course; (b) unused time for as-

sisting instructors varied from 36 to 77% for half days; (c) TRADOC performance criteria for critical tasks were extremely lenient, effectively guaranteeing that almost all students would qualify as SINCGARS operators regardless of performance; (d) several crucial operational procedures were not well learned; (e) class size, student-to-instructor ratio, and student-to-radio ratio were unrelated to performance; (f) the most frequent student criticism was that the course was too long; (g) SINCGARS training development includes no effective feedback loop for improving training; (h) decrement in operator performance during 2-1/2 months without practice was 20%; performance after 1 month's training may, without practice, drop 10 to 15% within 6 to 8 weeks; and (i) critical task performance times did not differ between a 24- and 32-hour course, which strongly suggests that SINCGARS training can be made more cost-effective. Training improvement suggestions were made in several areas, including course content, instructional procedures, and operator's manuals. Life-cycle costs for SINCGARS training could reach \$6 billion. This research suggests that half of these funds could be saved by incorporating certain readily made changes into the SINCGARS training program and by instituting a training research and development project designed to improve training while maximizing cost-effectiveness.

RR 1580 Leadership Performance Measurement in a Tactical Environment, Twohig, P.T.; Tremble, T., Jr. January 1990. (AD A232 792) For this report, observer-controllers evaluated the leadership performance of platoon leaders and platoon sergeants during three rotations at the U.S. Army's National Training Center. Platoon leaders and platoon sergeants were evaluated in terms of leadership tasks proposed as a guide for the Army's leader development system. The overall results suggested that the proposed leadership tasks are related to unit

performance and that the leadership framework provides a meaningful basis for measuring organizational leadership processes. However, improved methods are needed to yield measures that are specific to the separate components of leadership performance.

RR 1581 Distributed Training for the Reserve Component: Remote Delivery Using Asynchronous Computer Conferencing, Hahn, H.A.; Ashworth, R.L.; Phelps, R.H.; Wells, R.A.; Richards, R.E.; Daveline, K.A. January 1990. (AD A233 904)

This research was performed to evaluate the cost-effectiveness of using Asynchronous Computer Conferencing (ACC) and to develop guidelines for effectively conducted high-quality training using ACC. The evaluation used a portion of the Engineer Officer Advanced Course (E)AC). The same course materials presented in the resident course were developed for remote, asynchronous presentation. This delivery system was called the System for Managing Asynchronous Remote Training. The completion rate, performance, acceptability, and cost of remote presentation was compared to that of the resident program. The current state of Reserve Component (RC) training and the potential for remote training were described, as was previous research on remote learning. A summative evaluation was used to determine cost-effectiveness compared to resident training. A formative evaluation and literature review were used to develop guidelines for conducting ACC training. The summative findings were as follows: (1) ACC training costs less than resident; (2) there were no differences between resident ACC students on objective performance measures; (3) ACC students perceived a greater learning benefit than resident students; (4) Acc training had greater user acceptance, especially when group activities were implemented; and (5) resident training is superior to ACC training in both duration (i.e., resident training takes less time) and completion rate. The formative

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findings were as follows: (1) deadlines and group activities were the most effective pacing aids; (2) group interaction motivated student participation; (3) 8 hours per week, covering all aspects of working on the course, is a reasonable student requirement; (4) immediate feedback is preferable to delayed feedback and the course structure should allow students to move ahead whenever practicable if feedback is delayed; and (5) support communications, such as a telephone hotline, are critical to the success of an ACC course. This report provides guidelines for implementing ACC courses to maximize throughput, performance, and acceptance. It also presents evidence supporting the cost-effectiveness of ACC as a method of delivering remote training to the Army Reserve Components.

RR 1582 Readiness and Family Factors: Findings and Implications

From the Literature, Oliver, L.W. February 1991. (AD A234 291) In response to Army mandates, the Army Family Research Program (AFRP) is conducting research on the influence of families on readiness and other issues of interest to the army. This report is concerned with the relationship of family factors to readiness. The author discusses the definition and measurement of readiness, reviews what is known about how families affect readiness, describes how the AFRP will add to our understanding of family factors and readiness, suggests policy and program implications based on existing findings, and discusses additional research needs.

RR 1583 Identifying Tank Gunnery Skill Requirements on the Institutional Conduct-of-Fire Trainer (I-COFT),

Graham, S.E.; Smith, T.E. March 1991. (AD A235 597) The U.S. Army Armor School (USAARMS), as directed by the Commander, Training and Doctrine Command (TRADOC), is developing a device-based training strategy. A primary goal of the strategy is to specify an

optimal mix of field and simulation-based tactical and gunnery training. In support of the evolving strategy, this research developed and validated a set of analytical methods for identifying the underlying skill requirements of the tank gunner in armor gunnery tasks. The methods were tried by identifying the particular skills that are trained by the Institutional Conduct-of-Fire Trainer (I-COFT). To validate the skill assessment methods, an I-COFT tank gunnery test was administered to 18 soldiers enrolled in the initial-entry Excellence in Armor (EIA) program before and after 14 hours of EIA I-COFT training. The I-COFT test was also administered to 10 Noncommissioned Officer (NCO) gunnery instructors. A series of analyses compared changes in performance caused by training and differences between the EIA soldiers and NCOs. Skill development and error analysis methods were also developed, the results of which showed relative rates of skill development. The results showed that the skills needed to accurately hit stationary targets developed very quickly, as no differences were found between NCOs and EIA soldiers at the end of training. In contrast, the skills required for speed on both stationary and moving targets continued to develop across the full range of skill levels. The error analyses revealed that stationary target misses were mostly due to aiming too high or too low and that moving target misses were due to poor tracking. NCO tracking errors were largely the result of tracking too fast. Taken together, the analyses showed that tracking skills primarily accounted for speed and accuracy on both stationary and moving targets. Plans are underway to examine the generalizability of the skill assessment methods with other Armor training devices, including the Guard Unit Armory Device Full-Crew Interactive Simulation Training (GUARD FIST) and the Precision-Range Integrated Maneuver Exercise (PRIME).

RR 1584 Task Analysis and Workload Prediction for the MH-47E Mission and a Comparison With CH-47D Workload Predictions; Volume I: Summary Report, Bierbaum, C.R.; Hamilton, D.B. March 1991. (AD A237 500) For this research, a mission scenario was used to conduct a comprehensive task analysis for MH-47E operations. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission. Researchers identified 5 phases, 15 segments, 73 functions, and 239 tasks. They also identified the crewmember performing each task and derived estimates of the sensory, cognitive, and psychomotor workload associated with the tasks. Estimates of the task durations also were derived. The mission/ task/ workload analysis data were used to develop a computer model of workload for MH-47E crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining the tasks into functions and the functions into segments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-47E pilot and copilot was compared to the CH-47D baseline workload prediction to determine the impact of the advanced technology on the MH-47E. The comparison indicated little difference in the predicted workload for the pilot and indicated a lower predicted workload for the copilot in the MH-47E. Volume I of the report describes the methodology and summarizes the results of the research. Volume II contains the appendixes, which present the workload predictions of the CH-47D model; the MH-47E mission/task/workload analysis, decision rules, and workload predictions; and a comparison of the predictions from both models.

RR 1585 The Economic and Non-Economic Determinants of Retention in the Reserve/Guard Units, Fugita, S.S.; Lakhani, H.A. March 1991. (AD A240 750) This research predicts likelihood of Reserve/Guard retention based on military earnings, civilian earnings, spouse's earnings, spouse's attitude toward retention, other income, and total years of service, including active duty service. The data are developed from Defense Manpower Data Center's (1987) surveys of Reserve/Guard officers and enlisted personnel. The results reveal that retention can be increased by increasing Reserve/Guard pay and allowances or changing Reserve/Guard spouse's attitude toward retention.

RR 1586 Devices and Aids for Training M1 Tank Gunnery in the Army National Guard: A Review of Military Documents and the Research Literature, Morrison, J.E.; Drucker, E.H.; Campshire, D.A. April 1991. (AD A240 628) The research described in this report represents a preliminary step in the development of a device-based, tank gunnery training strategy for use at the company level by the Army National Guard (ARNG). Six devices and aids relevant to gunnery training in an armory environment were selected for detailed review: (a) M1 TopGun; (b) M1 Videodisc Interactive Gunnery Simulator (VIGS); (c) M1 Mobile Conduct-of-Fire Trainer (M-COFT); (d) Guard Unit Armory Device Full-Crew Interactive Simulation Trainer, Armor (GUARD FIST I); (e) Simulation Networking (SIMNET) battlefield simulation system; and (f) Hand-Held Tutor (HHT). Military documents and technical literature were examined to identify the training functions that the devices and aids are intended or conjectured to serve. The research literature was analyzed to discuss the training effectiveness of the six devices and aids with respect to (a) skill acquisition, (b) skill retention, (c) prediction of performance, and (d) transfer of training.

RR 1587 A Device/Aid-Based Strategy for Training M1 Tank Gunnery in the Army National Guard, Morrison, J.E.; Campshire, D.A.; Doyle, E.L. April 1991. (AD A240 752) Training devices and aids can help overcome constraints to on-tank gunnery training in the Army National Guard. This report describes a strategy for using devices and aids to train gunnery. The training strategy is divided into five components, each of which refers to a general problem in training: 1. Identification/organization of training objectives. Training objectives for the device/aid-based training strategy were derived from on-tank exercises described by the *Tank Combat Tables*, FM 17-12-1 (Department of the Army, 1988b). The objectives were organized into a four-level learning hierarchy of gunnery training: preliminary, basic, intermediate, and advanced. 2. Assignment of training devices/aids to the objectives. Training devices and aids were assigned to the four phases of training by matching performance requirements of the combat tables to the capabilities of the training devices/aids. The results of this matching process indicated that the devices and aids overlapped in function, and each can be used in more than one phase of training.

3. Allocation of training time to the devices/aids. Training time was allocated on the basis of data obtained from two sources. For the officially fielded devices, the suggested training times were obtained from the *Armor Training Strategy*, ST 17-12-7 (U.S. Army Armor School, 1990a). For TopGun and the Hand-Held Tutor, estimated training times were derived from the results of empirical evaluations of these research technologies.

4. Specification of instructional content. For each of the four training phases, the instructional content of training was determined by specifying (a) training goals, which were defined as sets of exercises that soldiers, crews, or platoons should strive to

complete, or level of proficiency that they should attain; and (b) diagnostic exercises, which were device/aid-based performance evaluations for assessing the proficiency of soldiers/crew/platoons on devices and their readiness for on-tank training.

5. Overall management of training on devices and aids. Several issues related to training management were discussed. One training management issue was the proposed sequence of training, which differed as a function of initial and sustainment training. Another set of issues related to the key features of the instructional strategy and their effects on skill acquisition, sustainment, and transfer. The final issue concerned implementation problems introduced by the strategy. Also, some potential solutions to the problems were discussed.

RR 1588 Devices and Aids for Training M1 Tank Gunnery in the Army National Guard: A Detailed Analysis of Training Requirements, Campshire, D.A. April 1991. (AD A240 931) This report is the second in a series of four reports that describe the development of a device/aid-based strategy for training M1 tank gunnery in the Army National Guard (ARNG) at the company level. The first report reviews the military and research literature on five computer-based armor training devices and one training aid designed to train gunnery skills and knowledge for the M1 tank. This report assesses the capabilities of the devices and the aid reviewed in the first report to support gunnery training. The third report reviews current ARNG training practices, emphasizing the devices used and conditions that constrain gunnery training. The fourth and final report integrates the results from the first three reports and presents a detailed training strategy for using training devices and aids to support and augment on-tank gunnery training. This report assesses the devices by determining whether the devices (i.e., TopGun, the Videodisc Inter-

active Gunnery Simulator [VIGS], the Mobile Conduct-of-Fire Training [M-COFT], the Guard Unit Armory Device Full-Crew Interactive Simulation Trainer [GUARD FIST I], and the Simulation Networking [SIMNET] battle simulation system) are capable of simulating the tank components and gunnery conditions associated with M1 tank gunnery, and the degree to which gunnery behaviors can be performed. The assessment of the training aid (the hand-held tutor) was conducted by determining whether the courseware for the aid is capable of imparting basic gunnery knowledge. Summaries of the results of these analyses are presented and the strengths and weaknesses of each device and aid for training armor gunnery are discussed.

RR 1589 Analysis of Army Recruiter Selling Techniques, Choko, L.B.;

Madden, C.S.; Tanner, J.F.; Davis, R. April 1991. (AD A240 841) In 1990, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) conducted research on Army recruiter on-the-job training (OJT) programs. This report is one of a series of three reports that document the research efforts. An analysis of U.S. Army recruiter sales techniques and practices was conducted. The report presents information about recruiter selling techniques, effectiveness, and alternatives, and makes recommendations for improving selling effectiveness.

RR 1590 Instructional Needs Analysis of the USAREC On-The-Job Recruiter Training Program, Hull, G.L.; Nelson, W.A. April 1991. (AD A237 800)

During 1990 the U.S. Army Research Institute for the Behavioral and Social Sciences conducted research on Army recruiter on-the-job training (OJT) programs. This report is one of a series of three reports that document the research efforts. The report contains the results of a training needs analysis of recruiter OJT programs and training methods. It also ad-

dresses training issues for developing recruiters' skills and productivity. Last, the report contains recommendations for recruiting policy makers to guide future change and research efforts.

RR 1591 Assessment of the Operations

Planning Tools During a Division-Level Command Post Exercise, Falleisen, J.J. April 1991. (AD A237 799) This report documents the findings of an assessment of the Operations Planning Tools (OPT) during a command post exercise. The OPT prototype was developed to identify soldier-based requirements for tactical planning aids. OPT was designed to provide support for battlefield visualization, wargaming estimates, and information management. For the assessment, OPT was set up in the planning cell of a permanent exercise facility of a National Guard division headquarters. Because there was no time for training on OPT before the exercise, contractor personnel operated OPT at the direction of the plans staff. Data were collected by observing the plans staff perform their duties and from post-exercise surveys. OPT was used throughout the weekend exercise and received favorable comments from all respondents. The assessment prompted ideas for improvement in OPT, including the need to regulate attrition and for a rapid capability to designate multiple units in wargaming interactions. The assessment also demonstrated the need to have established procedures for using decision aids in the context of the normal operating environment.

RR 1592 Unit Training Management System, Strategy and Program for

Simulation Networking (SIMNET), Madden, J.L. June 1991. (AD A239 916) This report presents a design for a training management system, strategy, and plan for SIMNET-based training. It addresses the training doctrine described in FM 25-100, Training the Force, and the associated Inte-

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grated Training Management System (ITMS) and Standard Army Training System (SATS).

RR 1593 Executive Development Through Asynchronous Computer Conferencing, Strait, M.J. June 1991. (AD A241 130) This report describes the investigation of computer-mediated communication as a mechanism for executive development. The specific computer-mediated technology examined was asynchronous computer conferencing (ACC). The evaluation included a conceptual analysis of executive development based on literature in the fields of social, industrial/organization, and developmental psychology. In addition, researchers describe historical and current applications of ACC, including surveys, active computer conferences, and expert interviews. Researchers found little evidence of ACC use by executives. However, the results suggest that ACC could support executive leadership development if integrated into the work organization environment at all levels, including the executive levels. Key issues and conditions for successful ACC implementation are presented.

RR 1594 Individual Ready Reserve (IRR) Call Up: Attitudes, Motivation, and Concerns, Steinberg, A.G. June 1991. (AD A239 362) This paper presents the findings of the ARI Individual Ready Reserve (IRR) Training Task Force with respect to IRR attitudes, motivation, and concerns upon call-up for the Persian Gulf war. The responses to a questionnaire developed by the task force and data from three existing data bases were used to identify problems that occurred during the call-up process and assess the impact of the call-up on the IRR. The results indicated that many of the IRR soldiers were not happy about being called up, had serious concerns about their treatment at in-processing, and/or were seriously concerned about the call-up's disruption of their lives. The report summarizes their concerns and

provides recommendations for improving the call-up process.

RR 1595 Individual Ready Reserve (IEE) Call Up: Skill Decay, Sabol, M.A.; Sukenik, M.S.; Sukenik, H.H.; Kern, R.P. June 1991. (AD A239 371) Soldiers from the Individual Ready Reserve (IRR) called-up for the Persian Gulf war were tested at mobilization stations to determine the extent of skill decay since their release from active duty. Results of these tests, which included hands-on performance, written, and weapon qualification scores, were merged with data from personnel files and responses to a 31-item questionnaire on attitudes, job experience and personal impact of the call-up. The major findings were: (a) knowledge about Army jobs decayed mostly within 6 months; weapons qualification skills decayed mostly after 10 months; (b) previous skill qualification score was the strongest predictor of skill decay followed by AFQT scores; (c) skill decay was higher in Armor and Combat Engineering fields and lower in Infantry, Maintenance, and Supply fields; and (d) skill retention was higher for those who entered the IRR directly from active duty.

RR 1596 First-Term Soldiers' Attitudes and Behaviors Regarding Reenlistment and Reenlistment Policies, Guthrie, T.J. July 1991. (AD A240 581) This report explores the effect of reenlistment policies and incentives on first-term soldiers' reenlistment intentions and behavior. A selected set of items from the 1986-1987 New Recruit Surveys (NRS) and the 1989 Recruit Experience Tracking Survey (RETS) was analyzed to address policy concerns. The results show that advanced educational opportunities, large cash bonuses, and a supportive chain of command increase the likelihood of reenlistment and that reenlistment behavior may be predicted from current reenlistment intentions. This report serves as an informa-

tion source for policymakers to evaluate the effects of reenlistment incentives and policies on reenlistment intentions and behavior.

RR 1597 Improving the Selection, Classification, and Utilization of Army Enlisted Personnel: Final Report on Project A, Campbell, J.P.; Zook, L.M. August 1991. (AD A242 921) This report describes the research conducted during Project A, a research project that represented the first phase of the Army's long-term program to develop a complete personnel system for selecting and classifying entry-level enlisted personnel. The goal of Project A was to increase effectiveness in matching first-tour enlisted manpower requirements with available personnel resources through validation of existing selection and classification tests and development of new and improved tests that will predict measures of job performance, including aspects of second-tour performance. The project, which began in 1982, was under the direction of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). The research included three main phases (a) evaluation of FY81/82 accessions' scores on the Armed Services Vocational Aptitude Battery (ASVAB) and subsequent Army performance; (b) selection of 19 Military Occupational Specialties (MOS) as a representative sample of the Army's 250+ entry-level MOS, development and field test of a preliminary battery of predictor-type tests and of a comprehensive set of job performance measures, and administration and evaluation of these instruments with FY83/84 Army accessions in the Concurrent Validation stage; and (c) administration of the revised predictor battery to 49,000 accessions from 21 MOS during FY86/87 and subsequent administration to 11,000 soldiers from this group during their first tour, in the Longitudinal Validation stage. Development and administration of second-tour measures were also begun under this project.

RR 1598 An Initial Assessment of the Flying Carpet System, Burnside,

B.L.; Bessemer, D.W. August 1991.

(AD A242 910) The Defense Advanced Research Projects Agency (DARPA) developed the Flying Carpet System to help tactical commanders plan and prepare for future battles. The system integrates combined arms simulation and other technologies to display a simulated Middle Eastern battleground with static force displays. U.S. Army Research Institute personnel assisted the Armor School with an initial assessment of the system's utility in January 1991, focusing on division-level planning activities. Results indicated that the Flying Carpet has several potential applications in the tactical planning and training arenas, but numerous refinements are needed prior to fielding.

RR 1599 Engineering Functions in Formulating Training Device Concepts, Meliza, L.L.; Lampton, D.R. August 1991. (AD A243 227)

Cost-effective application of technology to the design of training devices requires careful matching of training requirements with training device options. The goal of the training device concept formulation process (CFP) is to identify a cost-effective device or combination of devices to address a training requirement. The U.S. Army Project Manager for Training Devices (PM TRADE) Research and Engineering Management Division, known as E Division, performs system engineering activities during concept formulation that assess, integrate, and develop training device design concepts and cost estimates. This report presents the results of an E Division effort to define methods for aiding the training device CFP, emphasizing engineers' consideration of factors including skill acquisition and retention when defining materiel solutions to training requirements. It defines a baseline process model of the role of engineers in the CFP for training devices, identifies targets of opportunity for increasing the effective-

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ness and efficiency of CFP, and recommends courses of action.

RR 1600 A Research Needs Analysis for U.S. Army Special Operations Forces: Interim Report, Brooks, J.E. August 1991. (AD B160 125) This report describes the method and findings of a research needs analysis conducted by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) for the U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS). The report is an interim report because it documents the initial phase of a broader effort to identify research issues that are important to the U.S. Army Special Operations Command (USASOC), of which USAJFKSWCS is one element. The report identifies and discusses potential research issues in Special Forces (SF) personnel development through interviews of USAJFKSWCS, ARI, and USASOC staff and through analyses of data on officer and enlisted candidates in the Special Forces Assessment and Selection program. A SF personnel development model with recruitment, selection, job assignment, training, operational performance, and retention components provided a helpful framework for organizing the issues. Within each of the components, specific research issues and possible research approaches were identified that could improve the flow of personnel through the system and increase SF skill levels. The needs analysis findings are being used to prioritize SF research activities and to develop an effective program of research that is responsive to SF needs.

RR 1601 Computer Simulation Model of Cockpit Crew Coordination: A Crew-Level Error Model for the U.S. Army's Blackhawk Helicopter, Griffith, W.E.; Stewart, J.E., II. September 1991. (AD A243 618) The purpose of this research effort was to build a computer model of crew performance using a modeling language called

Micro Saint. The model predicts helicopter crew navigation and obstacle clearance errors as a function of variables (e.g., cognitive workload, crew experience and familiarity, crew communication and coordination). The UH-60 and MH-60K versions of the Blackhawk helicopter were used for this research because they are complex systems that require two pilots. Terrain flight navigation and approach and landing to a confined area were selected as mission phases because of high workload demands and the necessity that crewmembers communicate and coordinate with one another in order to perform them. This report traces the conceptual development of the model, along with lessons learned in the process of development. It also presents the results of four parametric experiments performed to validate the model and to test specific hypotheses concerning crew coordination strategy, experience, and mission and crew familiarity.

RR 1602 Cost and Effectiveness of Homestudy Using Asynchronous Computer Conferencing for Reserve Component Training, Phelps, R.H.; Ashworth, R.L., Jr.; Hahn, H.A. November 1991. (AD A244 359) The purpose of this research was to determine the effectiveness and costs of home study using asynchronous computer conferencing (ACC) for the Reserve Component (RC). A portion of the Engineer Officer Advanced Course was taught to RC officers using paper, video, and computer-based training materials; students and instructional staff communicated with each other using computer conferencing. A control group consisted of RC officers taking the same course in residence at the U.S. Army Engineer School. The findings were as follows: (1) ACC training costs less than resident training, (2) ACC and resident test and performance measures did not differ, (3) ACC students perceived a greater learning benefit than resident students, and (4) completion rates were higher for resident than for ACC students. These re-

sults indicate that ACC may be a cost-effective alternative to resident training for the RC.

RR 1603 Review of Armor Battalion and Below Automated Command and Control (C2) Soldier Performance Requirements, Bolte, P.L.; Black, B.A.; Mendel, R.M. November 1991. (AD A245 230)

The U.S. Army has entered into a program of research related to automated command and control (C2) tools for ground combat vehicles. This program, called Combat Vehicle Command and Control (CVCC), has a bilateral component with the ministry of Defense of Germany. The sponsor of this program is the Tank Automotive Command (TACOM). The U.S. Army Research Institute for the Behavioral and Social Sciences Fort Knox Field Unit is responsible for one of the five program teams. This report provides a brief description of the CVCC program from the perspective of user requirements and soldier-machine interface. It contains an overview of the potential problems in an automated C3 system from the operational perspective. Finally, it presents a sample of key issues that might be addressed through the use of soldier-in-the-loop simulation.

RR 1604 Training Effectiveness of the AH-64A Combat Mission Simulator for Sustaining Gunnery Skills, Hamilton, D.B. November 1991. (AD A244 820)

This research evaluated the effectiveness of the AH-64A Combat Mission Simulator (CMS) for sustaining crew gunnery proficiency. Although the research was originally designed to be conducted over a 12-month period, the time period was shortened to 6 months to overcome problems with crew attrition and to meet project deadlines. Baseline gunnery performance was measured both on the live-fire gunnery range and in the CMS for 30 AH-64A crews from an operational cavalry brigade. Subsequently, the crews were divided into two groups. The control group continued normal

unit training but was restricted from gunnery practice in the CMS. Each crew in the simulator group received five scenario-based gunnery training sessions in the CMS and normal unit training but was restricted from live-fire practice in the aircraft. Six months after the baseline measures, crew gunnery performance was again evaluated on the live-fire gunnery range and in the CMS for the 18 crews that remained in the experiment. The results failed to indicate CMS gunnery training effectiveness: Gunnery skill enhancement was not detected in the simulator group's performance and gunnery skill decay was not found in the control group. The failure to demonstrate the training effectiveness of the CMS is probably due to the high initial skill levels of the aviators and the lack of skill decay in the control group over a 6-month period.

RR 1605 AH-64A Gunnery Performance: Implications for Gunnery Standards, Hamilton, D.B. November 1991. (AD A244 819)

This research evaluated the difficulty of establishing standards in the Army's helicopter gunnery manual (TC 1-140) for AH-64A crew gunnery qualification. In addition, the research identified variables that influence AH-64A gunnery performance. Thirty AH-64A crews from an operational cavalry brigade participated in three live-fire gunnery exercises during a 6-month period. Engagement time and target-effect measures were collected for 480 gun, 576 missile, and 470 rocket engagements. The results indicate that exposure time standards will be difficult for operational units to measure. Target-effect standards for gun and missile engagements can be achieved, but the standards for rocket engagements will be difficult to attain. The influence of several variables on gunnery engagement time and target-effect performance was estimated. Target distance had a major effect on gun performance. Also, the distribution of rocket impacts was shifted constantly to the right and short of the target. Finally, a method

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for establishing gunnery standards is recommended.

RR 1606 Physical Performance Predictors of Success in Special Forces Assessment and Selection, Teplitzky, M.L. November 1991. (AD A245 729) This research examines the relationship between scores on two physical performance measures—the Army Physical Fitness Test (APFT) and a Ruckmarch administered early in the Special Forces Assessment and Selection (SFAS) program. The sample consisted of candidates from the 25 SFAS classes conducted in FY89 (N=2059), FY90 (n=2074), and FY91 (first 8 classes only, n=1863). Only candidates who met all SFAS prerequisites and were present for the first SFAS event were included in the analysis sample. Results indicated that APFT scores had an average correlation of $r=.25$ with success in the program, and the Ruckmarch had an average correlation of $r=.43$. Analyses designed to assess the utility of various APFT and Ruckmarch cut-off scores suggested that increasing minimum Ruckmarch scores would be an efficient way to raise success rates without eliminating potentially successful candidates.

RR 1607 Battle Staff Training and Synchronization in Light Infantry Battalions and Task Forces, Thompson, T.J.; Thompson, G.D.; Pleban, R.J.; Valentine, P.J. December 1991. (AD A245 292) This report examines issues related to battalion staff training, synchronization, and performance-measurement methodologies used to assess staff technical and tactical performance. A brief historical view of the function of staffs is presented, along with a description of existing staff training in the Army. Representative data focusing on staff functional-area effectiveness and synchronization at the combat training centers (CTCs) are presented. The comprehensive analysis revealed clear systemic training problems in preparing officers

to assume battalion staff duties, deficiencies in staff collective training and synchronization, and inconsistencies in current measurement systems in assessing command and control and staff synchronization performance. The report offers recommendations for solutions to staff functional-area training problems and details further research in the areas of staff synchronization and performance measurement.

RR 1608 Motivation and Platoon Performance at Combat Training Centers, Lawrence, G.H. February 1992. (AD A248 316) Under a Memorandum of Agreement with the U.S. Army Command and General Staff College, the U.S. Army Research Institute for the Behavioral and Social Sciences is conducting research to develop products to help small unit leaders improve performance in their squads, motivation powerfully affects the quality of performance. To improve Army leadership training, soldier motivation was measured and its relation to performance was assessed. As part of a larger effort, two scales designed to assess soldier motivation were administered to soldiers of all rank in 60 platoons from five light infantry battalions. The scales measures motivation with respect to (1) current job (2) expectations for the impending CTC rotation. Responses obtained before CTC rotations were compared with performance at the CTCs as rated by on-site observers and by the participants themselves. Interviews obtained after rotation were analyzed for improved understanding of soldier motivation in the field and its effect on performance. Data analysis of responses by squad members indicated that the designated scales provided a useful measure of motivation and that measure shows significant positive correlation with performance ratings made by objective observers. In general, respondents at all ranks expressed positive attitudes toward their jobs and their units. Post-rotation interviews data suggested a

theoretical difference between basal and situational motivation. The results of this research establish that valid and meaningful measurement of soldier motivation is possible. The basis for developing an instrument to assess and monitor soldier motivation is thus provided. The data presented also indicate that motivation at home station before CTC rotation affects subsequent CTC performance. An interpretation of soldier interview response may provide a basis for improvements in leadership training that will maximize motivation for effective field and training performance.

RR 1609 Relationships Between Vertical Cohesion and Performance in Light Infantry Squads, Platoons, and Companies at the Joint Readiness Training Center, Alderks, C.E. March 1992.

(AD A249 254) This paper presents the scales developed to determine weakness in vertical cohesion (cohesion between leaders and subordinates) between soldiers from squad members through company commanders. The weaknesses were termed "breaks." After a pattern of breaks was determined, the pattern was related to simulated combat performance at a U.S. Army Combat Training Center. No or few breaks in the platoon vertical-cohesion chain from squad member to company commander were associated with better platoon performance. Breaks in vertical cohesion with the top platoon leader (platoon sergeant and platoon leader) were associated with below-average platoon performance. A break at the squad leader level affected how the soldiers rated their proficiency prior to a rotation at the Combat Training Center but did not have significant bearing on platoon performance.

RR 1610 The Mobilization of Individual Ready Reserve (IRR) Infantrymen during Operation Desert Storm, Terry, P.M.; Evans, K.L.; Heller, F.H.; Smith, S. March 1992. (AD A250 143) This report

describes the Infantry Individual Ready Reserve (IRR) soldier during mobilization for Operation Desert Storm. Since mobilization is a historically rare event, the leadership of Fort Benning asked the U.S. Army Research Institute for the Behavioral and Social Sciences Fort Benning Field Unit to capture information that can be used to improve future mobilization (s) and mobilization planning. The statistically descriptive profile contained in this report is based on a survey of 2,641 Infantry IRR soldiers, direct observation, and supplementary performance data. Information is provided on soldier performance.

RR 1611 The Use of Incentives in Light Infantry Platoons, Lindsay, T.J.; Siebold, G.L. March 1992. (AD A240 425)

This research examined the perceptions of 995 soldiers in light infantry platoons concerning standard incentives in their units and whether the incentives were given to the right soldiers. Incentives examined were (1) public recognition for a job well done, (2) passes, (3) awards, (4) specialized training courses, (5) letters of appreciation or commendation, and (6) promotions. About 70% of the soldiers reported that the incentives were only seldom or occasionally used; about 50% responded that they were sometimes given of soldier motivation, job satisfaction, identification with the Army, pride in being a platoon member, cohesion, unit climate, perceived training proficiency, and positive unit training expectations. The report includes suggestions to improve the management of incentives.

RR 1612 Effectiveness of the AH-1 Flight and Weapons Simulator for Sustaining Aerial Gunnery Skills, McAnulty, D.M. April 1992. (AD A250 810) This report evaluates the effectiveness of the AH-1 Flight and Weapons Simulator (FWS) for sustaining crew gunnery proficiency in the AH-1F helicopter. Following an initial live-fire exercise, the participating AH-1 crews were

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port summarizes and integrates the findings of both phases.

RR 1632 Survey of Army Personnel Interested in Teaching, Feistritzer, C.E. November 1992. (AD A259 373) For this report, more than 600 Army personnel who had inquired about alternative teacher certification were surveyed to provide demographic data, information about goals and backgrounds, and other information that could help the Army ease the transition of personnel into the teaching profession. Results indicate that the Army has a significant number of individuals who are competent in a wide variety of subjects and who are interested in teaching careers, but who will require preparation, guidance, and transition assistance to successfully move into education.

RR 1633 Desert Storm Challenges: An Overview of Desert Storm Survey Responses, Halpin, S.M.; Keene, S.D. January 1993. (AD A260 289) This report provides an overview of data collected from participants in Operation Desert Shield and Operation Desert Storm (ODS). In January 1991, the Center for Army Lessons Learned (CALL) requested the assistance of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) in surveying personnel in ODS. Questionnaires were developed and distributed to virtually all commands involved in ODS. A total of 2,463 usable survey forms were returned to ARI. Respondents included 6 General Officers, 34 Colonels, 170 Lieutenant Colonels, and 111 Sergeants Major, and personnel from 12 divisions or separate brigades and from 62 corps or echelon-above-corps elements. The concept of the commander's intent was strongly endorsed and the value of rehearsals was emphasized by many of our respondents. Supply and distribution systems, personnel evacuation and reporting systems, communications, and intelligence flow were frequently mentioned as

problem areas. More detailed analyses will be required before conclusions or lessons learned may be derived from this data.

RR 1634 Individual Ready Reserve Infantrymen During Desert Shield/Storm Mobilization: Active Service and Demobilization Experiences, Terry, P.M.; Smith, S.; Heller, F.H. February 1993. (AD A268 953) This report presents a descriptive summary of the Infantry Individual Ready Reserve (IRR) soldier during the mobilization for Operation Desert Storm. Since mobilization is an historically rare event, the leadership of Fort Benning asked the U.S. Army Research Institute for the Behavioral and Social Sciences Fort Benning Field Unit to assist in capturing valuable information to provide insights that can be used to improve future mobilization(s) and mobilization planning. The statistically descriptive profile shown in this report is based on the results of a survey of 2,641 Infantry IRR soldiers, direct observation, and supplementary performance data. Information is provided on soldier performance, backgrounds, attitudes, concerns, and responses to the various events occurring early in the mobilization process.

RR 1635 Interdevice Transfer of Training Between the Guard Unit Armored Device, Full-Crew Interactive Simulation Trainer - Armor and the Mobile Conduct-of-Fire Trainer, Smith, M.D.; Hagman, J.D. February 1993. (AD A263 370) To examine interdevice transfer between the Mobile Conduct-of-Fire Trainer (M-COFT) and the Guard Unit Armory Device, Full-Crew Interactive Simulation Trainer—Armor (GUARDFIST I), and the relationship between tank gunnery performance on the two devices, a total of 34 Army National Guard tank crews were assigned to two groups. Group 1 pretested and trained on M-COFT and posttested on GUARDFIST I. Group 2 pretested and trained on GUARDFIST I and posttested

on M-COFT. M-COFT training improved the speed and accuracy of GUARDFIST I posttest scores, whereas GUARDFIST I training improved only the speed of M-COFT posttest scores. Performance on the two devices was significantly but moderately related, with higher correlations occurring between more temporally contiguous measures: pretest scores with training measures and training measures with posttest scores. Estimated time requirements for completion of training matrix engagement exercises on each device are provided. The findings suggest that the two devices can be used interchangeably to improve the speed of device-based tank gunnery engagements, but that M-COFT usage should precede GUARDFIST I usage to improve accuracy. Additional research is suggested to examine further the issue of GUARDFIST I to M-COFT transfer, especially with regard to gunnery accuracy and transfer to live-fire engagements from the two devices.

RR 1636 The Effects of Superimposing Symbology on a Simulated Night Vision Goggle Display, McAnulty, D.M.; Ruffner, J.W.; Hamilton, D.B. February 1993. (AD A263 458) The U.S. Army is acquiring a system that superimposes instrument symbology on night vision goggle (NVG) imagery. However, previous research indicates that the symbology may distract a pilot's attention from obstacle detection, recognition, and avoidance, and may interfere with proper scanning patterns. To test the effects of combining imagery and symbology, 36 helicopter pilots were presented night-flight scenarios simulating NVG imagery only, symbology only, and imagery plus symbology. The aviators were required to monitor and respond to predefined scene and symbology targets. They detected and responded rapidly to a high percentage of targets when viewing the scene-only and symbology-only scenarios. Their performance decreased significantly when the two types of information were presented to-

gether, but the decrease was small when compared to the increased amount of information available in the display. Aviator performance improved and was related to experience and eye dominance. The aviators suggested several modifications for the symbology suite.

RR 1637 Development of a Concept Formulation Process Aid for Analyzing Training Requirements and Developing Training Devices, Sticha, P.J.; Gibbons, S.; Singer, M.J. March 1993. (AD A263 579)

This report describes the development of a concept formulation process decision aid that addresses the trade-off determination phase. It adapts previously developed models for use during a specific step in the development of a training device. The report identifies the source of information used and explains the rationale for the development of different aspects of the system. A brief overview of the aiding system is presented. The goals of the aid are introduced and the steps taken to meet those goals are presented. The report describes the data elements, links between elements, and aiding functions and presents and discusses the evaluation of the system by projected users and the results of that evaluation. Difficulties discovered during development and suggestions for future research and development are presented.

RR 1638 Stinger Team Performance During Engagement Operations in a Chemical Environment: The Effect of Experience, Johnson, D.M.; Silver, J.D.

June 1993. (AD A268 952) This research compared the engagement performance of two groups of soldiers wearing the standard battle dress uniform (MOPP0) and the full chemical protective ensemble (MOPP4). The two groups of air defense soldiers varied widely in training and experience. Twelve Stinger teams were recruited during their last week of advanced individual training to become the low experience group. Another twelve Stinger

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teams were recruited from veterans newly returned from Operations Desert Shield and Desert Storm. All teams were tested in the Range Target System (RTS). Measurements were recorded for engagement performance, stress, and workload. Engagement performance was poorer during conditions of MOPP4 for both the lower and high experience groups. Engagement performance was better for the high experience group than for the low experience group regardless of MOPP conditions. Stress and workload ratings were higher when Stinger teams wore MOPP4 than MOPP0.

RR 1639 Avenger Team Performance During Engagement Operations in a Chemical Environment, Silver, J.D.; Lockhart, J.M. June 1993. (AD A269 111) For this report, the effects of Mission Oriented Protective Posture (MOPP) on Avenger weapon system operation were tested in an engagement simulation facility. Two experiments were conducted, each using the Avenger system in a different mode of operation. The same teams participated in each experiment, but team members switched duty positions for the second experiment. The team chief's ability to identify aircraft was significantly impaired by the MOPP gear in both modes of weapon system operation. The reduced field of view (FOV) created by the chemical protective (CP) mask is believed to have caused the MOPP4 performance decrement. The gunner, on the other hand, was not affected by the CP clothing, regardless of mode of weapon system operation. The advanced technology available to the gunner (easily seen displays and aids) seems to overcome the adverse effects of the MOPP gear.

RR 1640 Soldier Integrated Protective Ensemble: The Soldier's Perspective, Salter, M.S. June 1993. (AD A268 338) The field portion of the Soldier Integrated Protective Ensemble (SIPE) Advanced Technology Demonstration (ATD) was con-

ducted at Fort Benning, Georgia, from September through November 1992. Individual task performance data were collected by the Test and Experimentation Command (TEX-COM) Close Combat Test Directorate, and collective task performance data were assessed by personnel from the U.S. Army Infantry School (USAIS). Soldier impressions on and suggestions for the SIPE equipment were collected. As a technical advisory service to the SIPE ATD, U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) personnel collected this data. The SIPE, configured as a head-to-toe individual fighting system, demonstrated considerable potential for enhanced soldier capabilities and operational effectiveness. However, the equipment, only prototype in nature, affected test soldier performance and attitude. The enhanced communications capability and thermal sight on the rifle, as well as some items of clothing, were deemed very acceptable; other items were rejected or insufficiently tested. Further testing would be beneficial.

RR 1641 Family Service Providers' Evaluations of Medical Activities, Dental Activities, and Mental Health Services, Scarville, J. August 1993. (AD A273 275) Family service providers at 33 locations worldwide evaluated the available Medical Activities (MEDDACs), Dental Activities (DENTACs), and mental health services. Respondents strongly agreed that there was a need for these services, and most knew about the services and had made client referrals. Overall, service staff were perceived as competent or very competent, and the respondents were satisfied or very satisfied with the services. Although none of the three services examined had systemic problems with lack of privacy or poor publicity, some services in specific geographic regions did have reports of inconvenient hours, poor repairs, and overcrowding. There were reports of understaffing and long waiting times for MEDDACs and DEN-

TACs in all three regions (CONUS, Europe, other OCONUS). Further, there was evidence that mental health services were also coping with staffing problems.

RR 1642 Canceled.

RR 1643 The Impact of Army and Family Factors on Individual Readiness, Sadacca, R.; McCloy, R.A.; DiFazio, A.S. August 1993. (AD A269 458) The Army Family Research Program (AFRP) was initiated in Fall 1986 to examine the role that families play in the readiness of individual soldiers. The core of the research was a large-scale survey of Army soldiers and their units. Before the survey was administered, a series of preliminary analyses were conducted to reduce the number of survey variables to a subset that accurately accounted for the observed variation in individual readiness. The reduced set of variables was analyzed using LISREL within the framework of a model of individual readiness. The results of the analyses suggested that the most important family-related factor in individual readiness is the support that unit leaders provide to soldiers and their families. While, in general, individual characteristics were more important in the determination of soldier readiness than family characteristics, family characteristics did have significant indirect effects on readiness. Family characteristics also played a major role in the determination of intention to remain in the Army.

RR 1644-45 Canceled.

RR 1646 Prior Service Soldiers in the Special Forces Assessment and Selection Program: Recruitment Issues, Brady, E.J.; Brooks, J.E. October 1993. (AD A273 111) The U.S. Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS) requested assistance from the U.S. Army Research Institute for the Be-

havioral and Social Sciences (ARI) to examine the performance of Prior Service candidates in the Special Forces Assessment and Selection (SFAS) program. The purpose of the research was to inform decisions about the future recruitment of Prior Service soldiers for SFAS. In particular, USAJFKSWCS was interested in the likely impact of three proposed eligibility restrictions on the market of available candidates and on select rates in SFAS. Researchers analyzed data from enlisted candidates who participated in SFAS classes between January 1991 and March 1992. The findings showed that Prior Service candidates generally performed as well as Active Duty and National Guard/Reserve in SFAS, but had a higher rate of prerequisite swim failures. The data supported a proposed restriction on Prior Service soldiers with no combat arms experience, but other proposed restrictions concerning former branch of service and length of separation from Active Duty were not supported by performance data. Application of all of the proposed restrictions would have eliminated about two thirds of all Prior Service candidates in the sample. These findings and other considerations, such as Special Forces manpower requirements and Prior Service program administrative costs, will help Army leaders make informed decisions about the future of the program as a recruitment tool for Special Forces.

RR 1647 Longitudinal Research on Officer Careers: 1991 Follow-up of Initial Survey Findings, Connelly, D.W.; Dunn, L.F.; Phillips, D.A.; Schwartz, J.P.; Harris, B.C., ARI. October 1993. (AD A273 176) The purpose of the officer interview project was to enhance understanding of the findings from the Longitudinal Research on Officer Careers (LROC) surveys and to explore new career issues or Army topics of concern to officers that may need to be included in future surveys. In the fall of 1991, individual interviews were conducted with 458 company

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grade officers attending an Officer Advanced Course (OAC) at one of nine Training and Doctrine Command (TRADOC) schools representing 11 different branches. Questionnaires were completed by 276 newly commissioned officers who were attending the Officer Basic Courses (OBC) at these same TRADOC schools. In addition, 106 spouses of OAC officers completed questionnaires. Findings from the OAC interviews indicated that between 35% and 45% wanted to change branches to gain more marketable skills, to more closely match educational backgrounds to their jobs, or to provide challenge and experience in the "real Army." Officers felt that the Officer Evaluation/Selection System needed improvement in the way it was used, and gave reasons the system as it is currently used is not discriminating between fair, good, and excellent officers. Job stress was attributed to commander style, to attempting to do jobs with fewer resources, and to increased work hours. Most felt that these problems would be exacerbated during downsizing. The key issue for officers is resolution of the downsizing issue and provision of timely information about force reductions. Responses in the interviews suggested additional questions that may need to be addressed in future surveys.

RR 1648 Information Needs of Enlisted Soldiers When Making a Special Forces Career Decision, Herd, A.M.; Brooks, J.E. October 1993. (AD A273 343) This research identifies the kinds of additional information enlisted soldiers need when considering a Special Forces (SF) career. Researchers examined existing survey data and findings from SF recruiters and new SF recruits to identify gaps in job information. In addition, they conducted structured interviews and/or surveys with enlisted SF soldiers, SF wives, and commanders and staff within the SF community to determine the specific information that recruits need. Researchers concluded that soldiers need addi-

tional information in four key areas: family-related information, Military Occupational Specialties (MOS) and SF Group assignment processes, training and preparation, and SF missions and activities. They suggested ways to address the information gaps in these areas and proposed an outline for an information booklet that could serve as a realistic job preview. The booklet will provide comprehensive, realistic information about SF to prospective recruits and may also support SF recruiter training.

RR 1649 Soldier Perceptions of a Survey Question on "The Quality of Leadership and Management": Data from Ten Focus Groups, Savell, J.M. October 1993. (AD A275 105) This research sought to determine whether soldiers differ in their interpretation of a particular survey item (one that had been used in several recent surveys) and, if they do, what some of those differences are. The research was designed less to test ideas (or hypotheses) than to generate them. The item asked soldiers how satisfied or dissatisfied they are with "the quality of leadership and management" and provided four response alternatives ranging from "very satisfied" to "very dissatisfied." Forty officers and enlisted personnel, meeting in small groups that were homogeneous in rank, completed the survey, responded to a 2-item questionnaire concerning their interpretations of the item, and then participated in a follow-up discussion of those interpretations. Several generalizations (hypotheses) are suggested, along with some recommendations for revision.

RR 1650 An Investigation of Respondent Confidentiality Concerns in Army Surveys: Data from Ten Focus Groups, Savell, J.M. October 1993. (AD A275 200) This research sought information on whether soldiers believe the assurance of confidentiality they receive in a standard

Army survey and, if not, what reasons they give for not believing it. Participants (n=40), meeting in small homogeneous groups, completed a standard Army survey that asked questions on six topics of varying sensitivity. These same participants also completed a 3-item questionnaire asking about any confidentiality concerns they may have had while filling out the survey. Then, with their completed survey forms in front of them, they took part in a focus group discussion to elaborate on these concerns. This report summarizes the discussions and offers recommendations for further research.

RR 1651 Stinger Team Performance During Engagement Operations in a Chemical Environment: The Effects of Heat and Exercise, Silver, J.D.; Lockhart, J.M.; Redmond, D.P.; Brawner, P.A. November 1993. (AD A275 201) Research with Stinger teams (baseline) conducted under benign environmental conditions established that engagement performance of both the team chief and gunner was significantly impaired by the Mission Oriented Protective Posture (MOPP) clothing. This study replicated the experimental design used in the baseline research and included exposure to heat and exercise (HEX). Workload and stress levels, casualty rates, and physiological measures were significantly affected by the combination of MOPP gear, heat, and exercise. However, the expected Stinger engagement performance decrement did not occur. Explanations for the lack of a MOPP4, heat, and exercise decrement focus on the arousing effects of high heat on performance and motivational differences between the baseline and HEX groups.

RR 1652 A Review and Annotated Bibliography of Armor Gunnery Training Device Effectiveness Literature, Kraemer, R.E.; Rowatt, W.C. November 1993. (AD A275 258) This research report supports current efforts by the U.S. Army

Armor School (USAARMS) to develop its portion of the Combined Arms Training Strategy (CATS). The report contains a review and annotated bibliography of 39 documents that address tank gunnery training device effectiveness. It also presents a summary of (a) reported findings by types of device (stand-alone, tank-appended, subcaliber, laser) and areas of training effectiveness (skill acquisition, skill retention, performance prediction, transfer of training) and (b) research limitations (sample size, subjects not random or matched, groups treated differently, device system errors, insufficient amounts of practice, ceiling effects, unreliable performance measures) that could possibly affect interpretation of reported findings. Future research requirements are discussed based on the authors' conclusions.

RR 1653 The Optimization of Simulation-Based Training Systems: A Review of Evaluations and Validation of Rule Bases, Singer, M.J. November 1993. (AD A278 149) The Optimization of Simulation-Based Training Systems (OSBATS) was designed to provide engineers involved in the concept formulation process for simulators and training devices, a tool with which to consider and tradeoff alternative features. OSBATS would enable engineers to tradeoff fidelity and instructional features in the context of a training strategy to obtain designs that minimize cost for desired performance levels. OSBATS consists of five modules: a simulator decision module, a training device media selection module, an instructional features module, a fidelity optimization module, and a resource allocation module. The heart of the OSBATS model resides in the expert system rule bases used in the instructional features and fidelity optimization modules to make decisions about instructional and fidelity features to be incorporated in the simulator designs. This report presents an overview of the OSBATS model and prototype software and

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summarizes efforts to validate its utility. An effort to validate the instructional features and fidelity rule bases is described in detail. The approach used to validate the rule bases was to select example tasks and use the OSBATS rules to produce recommendations for fidelity levels and instructional features. Those results were then presented to two groups of subject matter experts: instructor pilots at the Aviation School at Fort Rucker, and researchers at the U.S. Army Research Institute for the Behavioral and Social Sciences Research and Development Activity at Fort Rucker, Alabama. The two groups were queried on their agreement with the OSBATS-generated recommendations for the tasks and their rationale for assigning fidelity features and instructional features to the tasks. The results of the group interviews are summarized and discussed in the context of the previous evaluations of OSBATS. Requirements for development and fielding of OSBATS-derived software are discussed in the conclusion.

RR 1654 Trial Application of the Embedded Training Guide to an Armored System: Lessons Learned, Witmer, B.G. November 1993. (AD A275 279) In June 1991, the U.S. Army Research Institute for the Behavioral and Social Sciences published "A Guide for Early Embedded Training Decisions." That document, for the first time, provided the Army with specific procedures for determining what training to embed in weapons systems and what to train by other means. This report describes a trial application of the embedded training (ET) guide for a proposed armored weapons system. It describes the procedures used to apply the ET guide and the lessons learned from that application. Included are procedures for compiling and clustering tasks and source documentation for the embedded training analysis, and suggestions for improving use of the decision flowcharts in performing the analysis. Application of the ET guide to the future armored system demon-

strates that the guide can be used to make objective recommendations for using ET for a complex weapons system. Six problems were encountered using the ET guide, but all were easily corrected with minor alterations to a few of the decision flowcharts and help screens.

RR 1655 An Approach to Identifying Future Brigade Tasks, Dressel,

J.D. December 1993. (AD A275 686) This Research Report describes the development and initial test of an approach to collect Brigade training information from military experts. Central to the approach is the use of battlefield situations that Army military officers "can respond to in an open, nonevaluative fashion. The situations represent futuristic battles that a Brigade must take part in to accomplish its mission. Army experts are asked to identify the tasks that would have to be performed to achieve success in combat. Preliminary results of the task data and conclusions about the approach are presented.

RR 1656 An Analysis of Personal Discount Rates: Evidence from Survey Data, Francis, B.D.

December 1993. (AD A277 643) In fiscal year 1992 the Army began reducing the number of active duty personnel as part of post-Cold War efforts to reduce defense spending. Two financial incentives—a lump sum and an annuity—were offered to induce mid-career personnel to leave before retirement. Among soldiers who accepted these incentives, over 90% of enlisted and 57% of officers chose the lump sum. At this time, the U.S. Army Research Institute for the Behavioral and Social Sciences mailed surveys to 51,000 soldiers. The surveys examined a number of policy issues, including separation programs. Unlike earlier surveys, soldiers were given the opportunity to reveal their preferences for lump sum and annuity programs. From the survey data, a series of personal discount rates were derived. A wide

disparity is found between personal discount rates and the program's internal rate of return. Personal discount rates explain the strong preference that separating soldiers have for the lump sum option and suggest improvement in the design of exit options. The survey is validated by comparing survey responses of approximately 400 soldiers with their subsequent decisions concerning early separation.

RR 1657 Perspectives on Organizational Change in the Canadian Forces, Pinch, F.C. January 1994. (AD A277 746)

This report reviews and synthesizes the background literature and other documentation relating to transition from a homosexual ban to the cancellation of the exclusionary policy in the Canadian Forces. The open literature was reviewed to provide the conceptual basis for systematic analysis of policy and research documents. An extensive review and study over a 6-year period failed to provide information to justify or defend the exclusionary policy for homosexuals.

RR 1658 Family Adaptation to the Demands of Army Life: A Review of the Findings, Schumm, W.; Bell, D.B.; Tran, G. January 1994. (AD A285 952)

This report reviews 188 recent reports of military and civilian research that consider the main challenges facing military families. The report discusses how to adapt to the potential stresses of (1) relocation, (2) living in a foreign culture, (3) prolonged family separation, (4) physical danger, and (5) the institution of the Army itself. The sources for these reports are the three agencies that were required by the Army to examine this challenge: the U.S. Army Research Institute for the Behavioral and Social Sciences, the Walter Reed Army Institute of Research, and the RAND Corporation. In this report, adaptation is defined as the ability of soldiers and their families to meet Army demands and to achieve personal

and family satisfaction at the same time. The stressor that appears to pose the most serious threat to family adaptation is separation, which is even more stressful when combined with deployment to a war zone. Although there are many aspects of the Army as an institution that impact on families, perhaps the most stressful is the expectation that the mission of the Army takes priority, with the attendant consequences of long, often unpredictable, hours and extensive volunteer work for many of the soldiers' spouses. Finally, relocation is a frequent, but less demanding, stressor that can have both positive and negative consequences, depending on the attitudes and circumstances of the family.

RR 1659 A Comparison of Information in the Joint Readiness Training Center Archival Records, Dyer, J.L. January 1994. (AD A277 676)

For this report, a comparative analysis was conducted of three primary archival data sources from the Joint Readiness Training Center (JRTC): the take home packages (THPs), company and task force after action reviews (AARs), and the training and evaluation outline (T&EO) data base. Task force and enemy missions/organizations, battle damage assessments, company tasks and performance, and critical incidents affecting mission performance were examined. This case study of two FY99 JRTC rotations was part of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) research effort on unit training and performance at the Combat Training Centers. Each source contained unique information. Sources complemented and supplemented each other, due partly to their differing purposes and the selectivity in the information reported. Sources also differed in ease of-use, with the THPs and the paper copy of the task force AARs the most user-friendly. The THP, when complemented by the paper copy and video tape of the task force AAR, will give most archive users a good understanding of

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each mission. When questions of interest narrow to specific systems, conditions, and/or missions, then all sources should be examined. The archive is located at the ARI Field Unit at Presidio of Monterey, CA.

RR 1660 MANPRINT Support of the Non-Line-Of-Sight Fiber-Optic

Guided Missile System, Sanders, W.R. January 1994. (AD A278 157) The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Fort Bliss Field Unit supported MANPRINT evaluations during the Non-Line-Of-Sight (NLOS) Fiber-Optic Guided Missile (FOG-M) System Force Development Test and Experimentation (FDTE), an Extended User Employment (EUE) program, and a Defense Simulation Network-Developmental (SIMNET-D) exercise. Crew performance, human factors, and target cuing impact on system performance were examined. The objectives of this effort were accomplished successfully. The effort developed and executed (1) user-level methods for evaluation, (2) effective strategies for integrating MANPRINT information and requirements into the weapon procurement process, and (3) demonstrations of MANPRINT potential for improving force readiness and system effectiveness. Lessons learned from these evaluations were provided to decision makers to support the acquisition program milestone decisions and the NLOS Critical Design Review process.

RR 1661 The Combat Vehicle Command and Control System: Combat Performance of Armor Battalions Using Interactive Simulation, Meade, G.A.; Lozicki, R.; Leibrecht, B.C.; Smith, P.G.; Myers, W.E. May 1994. (AD A282 112) This research evaluated the operational effectiveness, training, and soldier-machine interface (SMI) implications of a Combat Vehicle Command and Control (CVCC) experimental configuration that included the Commander's In-

dependent Thermal Viewer and a Command and Control display. Using M1 tank simulators in the Mounted Warfare Test Bed at Fort Knox, Kentucky, the researchers evaluated tank battalion operations. Each of twelve groups of soldiers completed a 1-week training and testing schedule that ended with a simulated combat scenario. One of a series, this report documents tactical unit performance and techniques and procedures employed to take advantage of the CVCC system's capabilities. Companion reports address operational effectiveness data and training and SMI-related findings. The collective findings provide input for the design and development of training programs for future automated command, control, and communications systems in ground combat vehicles.

RR 1662 Perceptions of Army Officers in a Changing Army, Harris, B.C.

June 1994. (AD A282 636) The purpose of the Longitudinal Research on Officer Careers (LROC) research project was to track the changes in attitudes and career experiences of company grade officers over time; to identify the individual, organizational, psychosocial, and family factors that influence officer career decisions; and to investigate the effects of policy change and world events on the attitudes and career decisions of officers. The LROC survey was conducted annually from 1988 to 1992. Interviews were also conducted in 1991. This report highlights results from the four surveys and the interviews. Specifically, the report focuses on the factors that potentially influence career decisions, namely, organizational identification, job/career issues, and the perceived impact of downsizing. Results indicate that officers participating in the LROC project were strongly committed to the Army; however, they were more concerned and less confident about their career prospects in 1992 than they were in 1988. About 35-40% of the officers were not in the branch of their choice. This branch mismatch negatively influenced

their job and career satisfaction and their perceptions of their career prospects. Officers who stayed in the Army over the 4 years of LROC became increasingly more concerned about their transition to a civilian job. More officers who left, in contrast, felt it would be easy to find a good civilian job. Officers were increasingly concerned about the negative impact of downsizing on them, their careers, and the Army. About 30% reported high to extremely high stress levels in their jobs. Increasing demands, high levels of stress, and few perceived alternatives for branch change or civilian opportunities may have a negative impact on morale, performance, and, ultimately, on readiness. Company grade officers are very vulnerable to the changes taking place in the Army and, as the middle of the workforce, would be impossible to immediately replace.

RR 1663 Peacekeeping in Somalia, Harman, J. July 1994. (AD A284 066) This report presents attitudes, opinions, and experiences of veterans of the Somalia peacekeeping deployment. Results of individual interviews and questionnaires show general discontent with the mission, although most soldiers expressed the opinion that the U.S. Army performed well in Somalia. The soldiers gave high ratings to the performance of their leaders, from battalion levels to unit levels.

RR 1664 Special Forces Qualification Course Class Attrition Statistics: FY89-FY92, Zazanis, M.M.; Teplitzky, M.L.; Diana, M. July 1994. (AD B188 580) The Fiscal Year 89-92 Special Forces Qualification Course (SFQC) class database allows researchers to examine trends in SFQC classes over time and across different Military Occupational Specialties (MOS). This report answers eight questions concerning trends in the composition and outcomes of SFQC classes over time and across MOS. Results show that notable changes have occurred across the four

fiscal years both in class composition and in class outcomes. These include an increase in the proportion of E-4's in each class, a decrease in the proportion of graduates, and a decrease in the proportion of dropouts from the field phase of training. Differences among the four MOS are of a smaller magnitude, but do occur. They include differences in graduation rates and in the number of students failing the MOS versus field phases of training. The report discusses the limitations of drawing conclusions from these data.

RR 1665 Analysis of Special Forces Medic (18D) Attrition, Graham, S.E. August 1994. (AD A285 659)

Training to become a Special Forces (SF) medic is extremely difficult, requiring both the academic skills to absorb tremendous amounts of medical information and the motor skills to master delicate hands-on medical procedures. Not surprisingly, the training has what is likely the highest attrition of any noncommissioned officer course in the Army. The primary objective of this project was to identify the causes of attrition from the SF medic (18D) qualification course. This was accomplished through a series of more than 100 interviews and development and administration of a questionnaire on training attrition. The results and discussion are organized around three major factors of attrition: selection, training, and evaluation and standards. In addition, a model is presented that can be used to help minimize attrition in the SF medic training course. A second objective of this project was to identify reasons SF medics are considering leaving SF and the Army. This was accomplished through analysis of a separate questionnaire that addressed SF career issues such as progression, training, credentialing, job satisfaction, and leadership.

RR 1666 Using the Backward Transfer Paradigm to Validate the AH-64 Simulator Training Research Advanced Testbed for Aviation, Stewart, J.E. II. Sep-

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tember 1994. (AD A285 758) The Simulator Training Research Advanced Testbed for Aviation (STRATA) is a modular simulation system for the AH-64 helicopter. The Adams and McAbee (1961) backward transfer of training paradigm was used to determine if AH-64 piloting skills transfer to STRATA. Ten AH-64 pilots participated in the experiment. They were asked to fly a mission scenario consisting of 13 single-pilot Aircrew Training Manual (ATM) tasks. No orientation or practice sessions were given. Most participants rated STRATA as highly similar to the AH-64 in handling, but be-

lieved the visual display system had limitations for extremely low-altitude tasks like hovering. Performance ratings during the experiment by a senior instructor pilot (IP) indicated that of the total 130 task events, 88.5% were performed to ATM standards. After the experiment, four independent judges, all aviators, rank-ordered participant performance on the stationary hover task using output from STRATA's automated performance measurement system. Rankings showed agreement between judges and high correlation with IP ratings made during the experiment.

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SN 93-01 The Development of Social Climate Measures from the 1991/1992 Surveys of Total Army Military Personnel: Scale Construction and Initial Validation, Blass, T. April 1993. (AD A265 226) The 1991/1992 Surveys of Total Army Military Personnel (STAMP) collected a wide range of information from Army military personnel on active duty and in the reserve components. This research report describes a systemic effort to derive a set of scales, with adequate psychometric properties, from a subset of 46 questions from the STAMP which deal with such issues as morale, group cohesiveness, stress, and perceived competence, i.e., a response domain that corresponds roughly to what has been referred to as social climate indicators (Futterman, Orlandi, & Schinke, 1991a, 1991b). The strategy that was followed was first to identify potential scales through factor analysis using the data from the sample of enlisted active-duty soldiers, determine the adequacy of their internal-structural properties, and then cross-validate the findings on the STAMP data collected from the active-duty officer sample. The result was a total of nine scales: Horizontal Cohesion, Vertical Cohesion, Social Support in Group, Perceptions of Work, Adequacy of Meeting Personal Needs, Satisfaction-Boredom, Identification with the Army, Stress and Worry, and Personal Efficacy. A final step was to provide initial evidence for the construct validity of two of the scales.

SN 93-02 Early Separation Incentives: An Analysis of Survey Data and Reenlistment Decision Making Models, Mitchell, S. May 1993. (AD A267 558) To reduce the military personnel force, soldiers are being offered incentives to choose early separation: the Voluntary Separation Incentive (VSI) (annual payments) and the Special Separation Benefit (SSB) (a lump sum). Using the

framework of occupational decision making, this research examined soldiers' responses to the incentives and identified factors affecting their decisions about separating. The analyses use data from the Survey of Total Army Military Personnel (STAMP), which was mailed to 51,000 active and reserve soldiers after Operation Desert Shield/Storm. STAMP surveyed morale, organizational commitment, leadership, training, career plans, adequacy of mobilization, and reactions to personnel policies such as VSI. Because STAMP covered many topics, the data supported assessment of soldiers' reactions to separation incentives and of their responses to variables in the Annualized Cost of Leaving (ACOL) Models. Correlations between a separation incentive and ACOL variable were examined to evaluate alternative Army Reenlistment Models. There are three main conclusions: (1) Army reenlistment models are a sound basis for understanding soldiers' decisions about early separation incentives and should form the framework of additional research in this area; (2) Years of Service and Rank relate to soldiers' separation decisions; and (3) soldiers' race and gender do not affect their decisions.

SN 93-03 Enhanced Forecasting and Allocation of Army Recruiting Resource Study, Charnes, A.; Golany, B.; Kress, M.; Pitaktong, U.; Rousseau, J.; Semple, J. August 1993. (AD A270 880) This note describes the enhanced forecasting and allocation of Army Recruiting Resources study—sequential hierarchical allocation of resource elements (FAARRS-SHARE) methodology and extensions to it. The results of the calibration and validation of enhanced FAARRS-SHARE and preliminary investigation of the applicability of the system to the Army reserve are presented. Software enhancements are also described. Enhanced FAARRS-SHARE provides the ability to forecast, allocate, and

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evaluate Army recruiting resources needed for desired accessions. It also provides the capability to evaluate quickly the effects of suggested changes in a program or resource availabilities. FAARRS-SHARE is based on innovative optimization techniques that provide "real time" responses to Army downsizing scenarios, including budget implications. The enhanced FAARRS-SHARE system employs a "semi-parametric" statistical method. Using Data Envelopment Analysis (DEA), an empirical frontier production function form of recruiting is estimated. Using this production function form, a total command annual leave multiplicative function form is estimated from battalion-level quarterly data. This form uses goal programming to be consistent with observed recruiting behavior. The elasticities implied in this production function are employed in optimization models to forecast contracts or resource levels.

SN 94-01 Development of the U.S. Army Research Institute's Officer Administrative Data Base: Appendixes, Ramsey, L.J.; Fertig, K.L.; Younkman, D.D. October 1993. (AD A277 679) This document describes the procedures performed to develop the Officer Administrative Data Base (OADB). The OADB consists of Warrant and Commissioned officer data for fiscal years 1979 through 1991. The data includes information from officers that received their original appointment from the Regular Army (RA), the United States Army Reserve (USAR), the National Guard of the United States (NGUS), and the Army of the United States (AUS). The source data are the Officer Master Files (OMF), which consist of all active duty U.S. Army officer personnel, and the Separation Officer Master Files (SOMF), containing all separations from active duty occurring within the fiscal year. The OADB data sets are available in both Statistical Analysis System (SAS) and character file formats.

SN 94-02 The Army New Personnel System Evaluation Model, Kennington, J.L.; Mohammadi, F.; Mohammed, R.A. October 1993. (AD A273 286) Manpower planning models have been used extensively by the Department of Defense for the past forty years. A manpower problem can be modeled as a Markov model, a linear goal program, or a combination of the two. Markov models use historical data to derive recruitment policies or to estimate the future structure of a manpower system. Linear goal programming models are used to evaluate the impact of changing a manpower policy, to determine recruitment policy, to forecast future budget requirements, and to establish the ability to significantly increase or decrease man strength in a short period of time. A combination of the two approaches is used to obtain optimal policies for a manpower system considering the cost and conflicting objectives. In this report, some of the models developed and techniques used for manpower planning are reviewed, and a new prototype model is developed. The model generator has been implemented in FORTRAN.

SN 94-03 Plan for the Evaluation of Job Assistance Centers, Sadacca, R.; Harris, D.A.; Laurence, J.H. August 1994. (AD A286 052) At the request of Army Career and Alumni Program (ACAP) administrators, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) assembled a working group that included an ARI representative, ACAP staff members, ACAP's Job Assistance Center contractor, and ARI's COMPR's contractor. The group developed a plan to evaluate Job Assistance Centers in terms of their effectiveness in preparing military and civilian individuals who separate from the Department of Defense to look for employment. The group also evaluated their cost-effectiveness to the Army.

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SR 93-01 Junior Leader Development in Army Units, Harman, J.; Tremble, T.R., Jr.; Goodwin, G.F. March 1993. (AD A265 024) This study describes procedures and practices used by battalion commanders, command sergeants major, company commanders, and company first sergeants in armor, mechanized infantry, and light infantry Army units to develop leadership skills in junior leaders. It examined orientation, assessment, feedback, development, and evaluation procedures, as well as ways to improve leadership development. Findings reveal wide variations from unit to unit in criteria for successful leadership and the satisfaction of both senior and junior leaders with existing procedures. These findings can be used by the sponsor to strengthen the link between institutional and operational leadership training.

SR 93-02 Training Recommendations Based on Opposing Forces

Practices, Sulzen, R.H. May 1993. (AD A267 827) This report is part of the studies and analyses program, the objective of which is to identify the performance characteristics that systematically differentiate effective and ineffective performers at the Combat Training Centers. After reliable differences have been identified among performers, the goal is to isolate those factors that might lead to the observed differences in performance. In an effort to improve the combat readiness of Army tactical units, the essential practices of the Opposing Forces (OPFOR) at the National Training Center (NTC) were reviewed with OPFOR Battalion and Company Commanders. The OPFOR were selected because of their consistently superior performance on the simulated battlefield. If selected techniques and practices employed by the OPFOR could be adopted and adequately practiced, by Army tactical units, those units could improve their training status and thereby, their combat readiness. The study identifies four OP-

FOR practices that are likely to improve tactical unit performance. As Army tactical units adopt the recommended OPFOR training practices provided, the combat readiness of the force should be substantially increased.

SR 93-03 A Multiperiod Model of U.S. Army Officer Retention Decision

Mackin, P.C.; Hogan, P.F.; Mairs, L.S. May 1993. (AD A268 241) This report describes a study on the determinants of officer retention behavior. Stay-leave decisions for field-grade active-duty officers in the Infantry and Signal Corps branches were examined using multiperiod ACOL-2 models. This effort expanded upon a pilot study involving the Air Defense Artillery branch. A multiperiod model that predicts officer career decisions as a function of economic, demographic, and Army personnel policies (e.g., military compensation) was successfully estimated with longitudinal data from the U.S. Army Research Institute for the Behavioral and Social Sciences Officer Longitudinal Research Data Base. The estimation showed that financial incentives exerted strong behavioral influence on retention, although there is evidence that the strength varies by branch. Civilian labor market conditions, as measured by the unemployment rate, had a significant effect on career decisions. Retention behavior also varied by source of commission, gender, race, and marital status. Finally, unobserved heterogeneity had a significant impact: as officer cohorts age, the distribution of unobserved tastes for the military becomes truncated and retention rates rise. This study also explored options for the design of a PC-based Officer Personnel Inventory, Cost, and Compensation (OPICC) policy analysis model. The report presents a proposed structure, along with a discussion of modeling tradeoffs necessary to balance policy maker analytical needs and costs. The Proposed structure for the OPICC model consists of three integrated modules: (a) a policy module that

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translates policy and other changes into changes in retention rates using econometric research results; (b) an inventory projection module that reflects the manpower effects of the policy changes; and (c) a cost module, using the Army Manpower Cost System (AMCOS) methodology, to capture the resources impact of policy changes.

SR 93-04 Why Promotable Female Officers Leave the Army, Steinberg, A.G.; Harris, B.C.; Scarville, J. July 1993. (AD A268 954) This paper presents the findings of a study designed to identify the reasons female Captains who were eligible for promotion to Major decided to take a monetary incentive and voluntarily leave the Army. Two sets of interviews were conducted: 73% of the females on the promotion list who decided to leave were interviewed by telephone and another group of Active Army officers was interviewed in person to determine the factors they considered in making their career decisions. The results indicated that (a) career decisions are based on multiple factors, (b) career decisions are based on an assessment of current conditions or progress and on perceived long-term career conditions and opportunities, (c) there is much overlap in the factors considered by those who decided to leave and those who have not decided to leave at this point, and (d) there is much overlap in factors considered by males and females. Both males and females took the following into account in their career decisions: career/promotion opportunities, equitable treatment, family issues, monetary incentives, and issues related to current and future downsizing and force restructuring. In addition, the female officers gave the following as reasons for leaving: gender discrimination, sexual harassment, joint domicile problems, and child care.

SR 93-05 Some Lessons Learned About Leadership in Operation Desert Shield/Storm, Savell, J.M.; Tremble, T.R., Jr.; Teague, R.C. July 1993. (AD A268

947) This study sought to identify lessons learned about leadership in Operation Desert Shield/Storm (ODS/S) that the Army could use to assess/update its leader development programs. Two questions were addressed: (1) In a situation like ODS/S, are any of the Army's nine leadership competencies (FM 22-100) considered more important than the others?, and (2) Is the Army's leader development program teaching the right things, in the right way, or do changes need to be made? To gather data, a questionnaire was administered to 357 ODS/S veterans (mostly Captains) attending leader development courses at the Army's Command and General Staff College. With respect to the first question, researchers concluded that these Officers viewed the competencies of decision-making, technical/tactical skills, and professional ethics to be among the most important for their own leadership in ODS/S and the competencies of teaching/counseling, use of available systems, and supervision among the least important. With respect to the second question, researchers concluded that these Officers (a) had a high opinion of the leadership they had received from their ODS/S commanders and (b) evaluated the Army's leader development program positively.

SR 94-01 Development of the U.S. Army Research Institute's Officer Administrative Data Base, Ramsey, L.J.; Fertig, K.L.; Younkman, D.D. October 1993. (AD A277 679) This document describes the procedures performed to develop the Officer Administrative Data Base (OADB). The OADB consists of Warrant and Commissioned officer data for fiscal years 1979 through 1991. The data includes information from officers that received their original appointment from the Regular Army (RA), the United States Army Reserve (USAR), the National Guard of the United States (NGUS), and the Army of the United States (AUS). The source data are the Officer Master Files (OMF), which consist of all active duty U.S. Army officer personnel,

and the Separation Officer Master Files (SOMF), containing all separations from active duty occurring within the fiscal year. The OADB data sets are available in both Statistical Analysis System (SAS) and character file formats.

SR 94-02 Examining the Self-Development Test for Race and Gender Bias, Silva, J.M. July 1994. (AD A283 528) The Self-Development Test (SDT) was examined for gender and race fairness. Three SDT versions with the largest male score advantage and three SDT versions with the largest White score advantage were selected for analysis. Potentially biased items were identified and analyzed, Item correlations with target construct, subject matter expert reviews, and the impact of removing all items showing large performance differences between subgroups were considered. The percentage of items showing large differences in subgroup performance ranged from 14 to 61 percent across the six SDT examined. However, few of these items showed a differential relationship with the target construct across subgroups and the subject matter experts could not identify the items that were more difficult for minority subgroups. Scoring the SDT after removing items with statistically significant differences did not generally eliminate the subgroup differences at the test score level. Although no support was found for race or gender bias in the SDT, differential assignments based on gender, along with SDT emphasis on material covered in some duty positions may give a performance advantage to males in some Military Occupational Specialties(MOS). An examination of assignment procedures for MOS showing large gender performance differences in SDT scores is recommended.

SR 94-03 Model Description and Proposed Application for the Enlisted Personnel Inventory, Cost, and Compensation (EPICC) Model, Smith,

D.A.; Eichers, D.; Rose, D.E., Jr.; Rostker, D. July 1994. (AD A283 496) The Enlisted Personnel Inventory, Cost, and Compensation (EPICC) Model is a PC-based analysis tool that aids Army personnel planners in assessing the inventory and cost implications of changes in compensation and other personnel policies. The EPICC prototype was developed by SRA Corporation under a research and development effort sponsored by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). EPICC assists Army personnel planners in assessment of the cost and inventory implications of alternative Army-wide policies that may be under consideration. It is the ideal tool for this purpose because it is composed of three modules that touch on all aspects of personnel policy analysis: an inventory projection module, a compensation module, and a cost module. The inventory projection module is the core of EPICC. Using an analyst-defined scenario, which includes specifications of both compensation and personnel management policies, the module "ages" a baseline enlisted force for up to 9 fiscal years. Along with the projected inventories, the module estimates losses (normal, involuntary, and forced), reenlistments and extensions, promotions, and non-prior-service accession requirements. The compensation-reenlistment module uses the analyst's assumptions about military compensation and macroeconomic conditions over the projection period to adjust base-year reenlistment rates for changes in these factors. The adjusted rates are then used in the inventory projection module to age the force. The cost estimation module calculates the budget costs of the enlisted inventories projected in the inventory projection module. Because the cost estimation process is fully integrated with the inventory projections, little additional user effort is required to obtain cost information along with personnel counts. This adds an important dimension to the personnel policy analysis model, as different strategies for achieving a desired force

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structure can be easily evaluated on the basis of expected costs. The cost estimation methodology in the EPICC model is derived from the budget model in the Army Manpower Cost System (AMCOS). EPICC provides the Army, for the first time, a single model in which inventory, cost estimation, and compensation-

reenlistment modules are linked. The integration of these three personnel analysis tools in EPICC facilitates the complete evaluation of policy alternatives by eliminating the often difficult task of working with three different, and sometimes inconsistent, models and improves decision-making ability.

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TR 862 Improving the Selection, Classification, and Utilization of Army Enlisted Personnel: Annual Report, 1987 Fiscal Year, Campbell, J.P. (ed). October 1989. (AD A219 046) The report describes research during the fifth year (FY87) of Project A, the Army's long-term program to develop a complete system for selecting and classifying entry-level enlisted personnel. During the fifth year, data obtained from administering experimental predictor and criterion measures to 9,500 soldiers in the project's concurrent validation stage was used to consider alternatives to the current Aptitude Area composites, evaluate methods for weighting criterion components in a composite index, and estimate the utility of various MOS/performance level combinations. Job analysis of second-tour performance was begun in preparation for future second-tour testing. Beginning the longitudinal validation stage, predictor tests were administered to approximately 48,000 1986/87 accessions in 21 MOS; samples from each MOS will subsequently be tested on first-tour and second-tour performance. This report is supplemented by a U.S. Army Research Institute Research Note (in preparation), which contains technical papers prepared during the year on specialized aspects of the project.

TR 863 Criterion Development and Project A Validities for the DX164 TOW2 Simulator, Czarnolewski, M. October 1989. (AD A219 973) This project validated Project A tests for TOW gunnery performance, provided algorithms for constructing Measures of Effectiveness (MOEs), and suggested an integrative approach (that considers both training and human ability) to identify critical human performance aspects of a weapon system. Fifty-one soldiers from MOS 11H with varying degrees of TOW2 gunnery experience were

tested with Project A reaction time, psychomotor, and spatial tests. Results indicated that these tests correlated with target acquisition times (when there is a hit) and with the probability of hitting a target during a Testing Effectiveness Evaluation (TEE) of the DX164 TOW2 simulator. The Project A Orientation Test (measuring mental rotation) and the One-handed Psychomotor Tracking Test correlated with hit probability at both pretraining and post-training performance sessions, most notably when soldiers wore fully protective gear (MOPP IV) for a nuclear, biological, and chemical conflict. MOEs were constructed for each firing point by combining the hit probability and acquisition time measures based on the O'Keefe and Guerrier (1988) model for an MOE. Algorithms were employed to construct composite MOEs to obtain a criterion measure of performance across all firing points. The Orientation Test maintained its prediction of pretraining and post-training performance for algorithms that incorporated the empirical relationships among the firing points. Discussion of TOW gunnery performance is based on an integrative approach that considers TOW gunnery stimulus testing conditions, the likelihood of encountering those conditions on a battlefield, practice effects, and ability measurement. Results suggest that Project A tests be used to select MOS 11H TOW gunners and the integrative approach presented be included in other research efforts, such as those being conducted under the MANPRINT initiative.

TR 864 Relationship of Family Satisfaction to Satisfaction With the Military Way of Life Among Soldiers, Bowen, G.L. November 1989. (AD A219 901) This research supports *The Army Family Action Plans* (1984-1989) by investigating the relationship between soldiers' satisfaction with the environment for families in the Army and satisfaction with the military way of life. The

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report is based on a secondary analysis of the responses of a stratified random sample of 9,198 U.S. Army personnel. The sample used is the Army sample that participated in the 1985 DoD Worldwide Survey of Officer and Enlisted Personnel. The importance of satisfaction with the environment for families to overall satisfaction with the military way of life was examined separately for officers and enlisted participants from six household types: (a) single, (b) single parent, (c) married to a military spouse with no children, (d) married to a military spouse with children, (e) married to a civilian spouse with no children, and (f) married to a civilian spouse with children. Seventeen additional variables measuring satisfaction with other military issues were used as control variables in examining this relationship, as well as the gender and pay grade of the member. The results suggest that satisfaction with the environment for families in the Army was a significant predictor of overall satisfaction for four of the twelve sample subgroups: (a) enlisted members married to other military members with no children, (b) enlisted members married to other military members with children, (c) enlisted members married to civilian spouses with children, and (d) officers married to civilian spouses with children. In each case, the results supported the major prediction of the research: the more satisfaction members have with the environment for families in the Army, the greater their satisfaction with the military way of life. Satisfaction with the environment for families in the Army was not a significant predictor of overall satisfaction with the military way of life for eight of the twelve subgroups: (a) single enlisted members and single officers, (b) single parent enlisted members and single parent officers, (c) officers who were married to other military members with or without children, and (d) enlisted members and officers who were married to civilian spouses children.

TR 865 Canceled.

TR 866 Simulation-Based Command, Control, and Communication Exercise for Armor Small Unit Commanders, Du Bois, R.S. November 1989.

(AD A218 869) This report documents the development of a simulation-based Armor small unit commander command, control, and communication (C³) performance assessment method. Unique to this effort is C³ assessment based on task-loaded, full crew interactive operations conducted in the Army's interactive simulation test bed, Simulation Network-Developmental (SIMNET-D). Nine small unit C³ tasks were selected for measurement in SIMNET-D. Multiple objective performance measures were identified and supported the development of criterion-oriented composite measures for each task. Task requirements were embedded in a 30-kilometer tactical exercise. Twenty-four tank-crew and platoon commanders and their crews completed the prototype exercise. Overall, the performance data obtained demonstrate the potential of simulation-based C³ assessment. Six of the C³ composite measures possessed split-half and Cronbach's alpha reliability coefficients above .50. Future small unit C³ exercise development and evaluation research requirements are outlined, including the need for investigations of (a) the relationship between soldier background and C³ exercise performance; (b) the test-retest reliability and validity of the C³ measures; and (c) an examination of additional C³ measurement approaches.

TR 867 Measuring Leadership, Motivation, and Cohesion Among U.S.

Army Soldiers, Mael, F.A. December 1989.

(AD A219 924) The purpose of this project was to develop measurement scales to use in determining and predicting small-unit effectiveness, as measured by success in simulated combat exercises. The relative impact of cohesion, motivation, and leader performance

were of particular interest. The need for concise, psychometrically sound, and military-relevant measurement of these constructs provided the impetus for the development and validation of these measures. In 1988, measurement scales were developed for the following constructs: platoon cohesion, job involvement motivation, identification with the Army, and two aspects of leadership: initiating structure and consideration. An initial questionnaire was administered in early 1989 to 252 platoon members and leaders. Means, standard deviations, internal consistency estimates, and scale factorial compositions were analyzed. After researchers used the results to rework the scales, they administered the questionnaire at a second site with 474 platoon members and leaders. The second administration also included measures of leader peer cohesion, field-exercise motivation, and the following aspects of leadership: participative leadership style, "boss stress," and leader upward influence. The measures were evaluated using the same psychometric method used to evaluate the first administration. The data justified the use of the scales. Reliability estimates were virtually all satisfactory. Factors analysis revealed 11 one-dimensional scales or subscales. the scales were considerably shorter than analogous scales used in civilian organizational research and achieved satisfactory face validity.

TR 868 The Military Retirement Accrual Charge as a Signal for Defense

Resource Allocation, Hogan, P.F.; Horne, D.K. December 1989. (AD A220 437) The effectiveness of our national defense depends not only on the total resources devoted to defense, but also on how those resources are allocated. An efficient allocation of resources is a function of the relative prices of the factors of production. We argue that the current accrual accounting method for military retirement distorts the price of manpower. Although the current system, which charges all services identi-

cal retirement rates, may be actuarially fair across the Department of defense, services with high turnover exhibit manpower prices that exceed actual costs, while services with low turnover are perceived to have relatively lower costs. Because manpower costs generally comprise a large portion of the cost of operating and maintaining hardware systems over their life cycle, distortions in the price of manpower may influence what hardware systems are purchased, the relative expenditures on manpower and hardware systems, and the relative size of the services, thus leading to an inefficient choice of resources and a reduction in national defense.

TR 869 Lessons Learned From Analyses of the Improved TOW Vehicle

With Implications for Future Systems, Schendel, J.D. January 1990. (AD A220 573) Early Compatibility Analysis (ECA) aids in replacing or improving existing equipment. ECA aims to identify problems in existing systems and to avoid them in follow-on systems. This report describes research involving a partial ECA using 61 M901/M901A1 Improved TOW (tube-launched, optically tracked, wire-guided missile) Vehicle (ITV) operator tasks. The research grew out of an ECA performed by the U.S. Army Infantry School (USAIS), Fort Benning, Georgia (USAIS, 1987). The results of the USAIS (1987) ECA were inconsistent with user-sponsor input and related test report data. One purpose of this research was to identify the source of the discrepancy between the ECA and other source data. A second purpose was to determine ways of enhancing the information generated from recommended ECA data sources. No attempt was made to examine all recommended data sources. Instead, the primary focus was placed on subject matter expert (SME) opinion, a major source of ECA data. in performing this research, every effort was made not to change fundamental ECA procedures. However, because of its experimental nature, some of the

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procedures that were employed were not standard ECA procedures. The results provided a basis for explaining the discrepancy between the results of the USAIS (1987) ECA and other source data. They also suggested several means for improving the information derived from recommended ECA data sources without changing the basic analytic methods.

Key results were as follows:

- (a) Soldiers who received rating materials that included task descriptions generally showed less variability in their ratings than soldiers who received rating materials that did not include these descriptions. Soldiers provided task descriptions also showed lower mean ECA task ratings than soldiers not provided these descriptions. As a result, soldiers in the former groups tended to rate fewer tasks as high drivers than soldiers in the latter groups.
- (b) Eight tasks were rated as high driver tasks. An additional task was included in the list of high drivers during the ECA validation process. Five of these nine tasks were operator maintenance tasks.
- (c) Data generally supported the need to include consideration for crew-level collective tasks in some type of front-end analysis like ECA.
- (d) Approximately 5 to 7 years of relevant experience appears to be the minimum required for raters to appreciate the seriousness of system-related problems or to report them as serious problems.
- (e) In terms of types of problems reported, there was a clear trend for soldiers in operational units to show greatest concern for problems associated with task performance and forgetting. There was an equally clear trend for instructors to show greatest concern for problems associated with learning and training.
- (f) Incorporating a fifth response alternative for ratings on which soldiers had no opinion or did not know how to respond was a way to limit guessing and to identify tasks that are

unfamiliar or infrequently performed.

(g) Collecting data on tasks (ECA) and on human factors engineering, system safety, and health hazards issues provided a clearer picture of the problems affecting the ITV than either type of data can provide by itself. Once these data were analyzed, it became apparent why the USAIS (1987) ECA did not indicate certain problems with the ITV. Eca focuses on manpower, personnel, and training issues. It does not provide for the direct assessment of human factors engineering, system safety, and health hazards issues.

(h) Desired Features Analysis was developed as a means of collecting information about the best or most desirable design features of the predecessor system, the best or most desirable features of systems related to the predecessor system, and ideas for improving the design of the follow-on system. Based on the quality of the input received, the approach appears to have merit.

TR 870 Comparison of Retention Patterns for Army National Guard and Army Reserve Units Participating in National Training Center, Reforger, and Blazing Trails Exercises, Grissmer, D.W.; Kirby, S.; Nogami, G.Y. January 1990.

(AD A220 315) This study compares attrition in National Guard and Army Reserve units attending National Training Center (NTC), Reforger and Blazing Trails exercises (Central America), with control units not attending NTC. Attrition is identified by following those individuals present 12 months before the exercise to 6 months following the exercise. Longer-term attrition trends are also presented for these individuals through the end of FY86. Statistical attrition models are estimated using the logit functional form to control for effects of different personnel composition among units. The statistical analysis is supplemented by case studies of units to identify causes of attrition. The results show that National Training Center units have higher

attrition results, but not Reforger or Blazing Trails units. Attrition rates are approximately 25% higher in National Training Center units than control units. Attrition rates in Reforger and Blazing Trails units are less than 5% higher than control units. The case studies identified four causes of increased attrition: lost of civilian income, employer conflict, family conflict, and marginal performance. An associated survey strongly supported the hypothesis of lost income and employer support, and weakly supported family conflict and marginal performance. National Training Center exercises demand a longer and more intense period of trainup followed by 3 weeks of annual training. In addition, individuals train more intensely at the National Training Center and are less able to resume normal civilian and family activities. In contrast, Reforger and Blazing Trails exercises at NTC usually do not require extra training and demand only 17 days of annual training.

TR 871 Construction of Realistic Messages From Computer-Generated Alert Messages, Lussier, J.W.; Solick, R.E.; Keene, S.D.; Linville, J.M. February 1990. (AD A220 436) Command groups are increasingly turning to computer-driven command post exercise (CPX) as an economical and convenient means of training. The overall realism of this method of training relies heavily upon the capabilities of the control staff, who must act as key personnel and generate an information stream of tactical messages. The messages produced in a CPX environment typically are not as realistic as the messages from field training exercises (FTXs). In this study, a set of messages was created using only the materials available to a CPX controller. This set of messages, unlike actual CPX messages, was found to be similar to FTX messages when judged by experienced Army officers.

TR 872 Power Analysis of Gunnery Performance Measures: Differences Between Means of Two Independent Groups, Morrison, J.E. January 1990.

(AD A219 917) Determination of sample size is a problem that has both practical and statistical implications for gunnery performance research. This report examines these implications in the context of statistical tests that compare means from two independent samples of armor crews. Performance variability estimates of gunnery data were derived from Table VIII qualifications at GrafenwÖhr and from published research on the Unit-Conduct of Fire Trainer (U-COFT). These data were used in examples to describe power analysis procedures developed by Welkowitz, Ewan, and Cohen (1982) for determining power and sample size and to calculate minimum detectable differences (MDDs) between two samples of crews assuming a two-tailed test of significance with a standard significance criterion of .05 and power set to .80. One of the more notable findings from this analysis was that statistical comparisons of company-sized samples of crews (i.e., $N = 14$) are relatively insensitive to mean differences in speed and accuracy of performance. The limitations of the proposed methods for other tests of significance are also discussed.

TR 873 The Effects of Mental Practice on Tank Gunnery Performance,

Morrison, J.E.; Walker, S.A. February 1990. (AD A219 916) The objectives of the present research were (a) to determine whether mental practice instruction enhances gunnery skill acquisition, and (b) to identify individual differences that relate to the use and effectiveness of mental practice. Three measures of individual differences were obtained: (a) the GT composite from the ASVAB, (b) Rotter's (1966) Internal/External (I/E) Scale, and (c) Betts' Questionnaire Upon Mental Imagery. Intact platoons of entry-level soldiers were assigned to either an experimental group that received

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mental practice instruction in addition to their normal gunnery training on the Institutional Conduct-of-Fire Trainer (I-COFT) or to a control group who received only normal I-COFT gunnery training. Students were pre-tested on their gunnery skills using a standardized I-COFT exercise. After 7 hours of training, all students were tested on the same standard exercise. Students also completed a questionnaire that assessed their use and evaluation of mental practice techniques. Results from the questionnaire indicated that soldiers in the control group mentally rehearsed gunnery without instruction to do so, although soldiers in the experimental group were more likely to use commonly prescribed mental practice techniques. Correlations in the control group indicated that soldiers high in intelligence or mental imaging ability responded much like soldiers in the experimental group; in contrast, the I/E scale did not predict the use of mental practice techniques. Results from the performance tests failed to show differences between experimental and control groups that could be attributed to mental practice. Two problems, however, make it difficult to reach conclusions about the effectiveness of mental practice in this experiment: (a) students in the control group spontaneously used mental practice techniques; and (b) the initial superiority of the experimental group in gunnery performance may have masked any gains due to mental practice.

TR 874 The Relationship Between the Perceived Level of Organizational Support for Families and Spouse Satisfaction With Military Life, Bowen, G.L.; Neenan, P.A. February 1990. (AD A219 925) This research supports *The Army Family Action Plans (1984-1989)* by examining the relationship of satisfaction with the perceived level of organizational support for families and overall satisfaction with military life among civilian spouses of Army members. The report is based on an analysis of the responses

of 2,814 Army spouses to the 1985 DoD Survey of Military Spouses. The relationship of satisfaction with perceived organizational support for families to overall satisfaction with the military as a way of life was analyzed for four categories of Army spouses: (a) spouses without children married to enlisted members, (b) spouses with children married to enlisted members, (c) spouses without children married to officers, and (d) spouses with children married to officers. To assess the unique contribution of the independent variable to overall civilian spouse satisfaction with the military way of life, fifteen subdomains of satisfaction relating to the military way of life were used as control variables, as were the gender of respondent and pay grade of the military spouse. The findings strongly suggest the presence of a positive and significant relationship between satisfaction with the perceived organizational support for families and overall level of satisfaction with the military way of life. This relationship holds across all four categories of respondents, even when selected subdomains of satisfaction pertinent to the military way of life are held constant. Rather than showing a uniform pattern across the four subgroups of respondents, the independent variable explained a greater proportion of the variance in the dependent variable for civilian spouses of officers with children than for the other groups. This represents a preliminary analysis aimed at developing hypotheses that will be tested in the analyses of the data set to be developed in the large data collection effort by the Army Family Research Program (AFRP). The Army sponsor for this effort, the Army Community and Family Support Center (CFSC), reviewed and approved an earlier draft of this report. Their comments indicate that the contents of this report will be useful in revising Army programs and policies.

TR 875 Identification of Command Post Exercises (CPX) and Field Training Exercises (FTX) Messages, Keene,

S.D.; Solick, R.E.; Lussier, J.W. February 1990. (AD A220 385) Command groups are increasingly turning to computer-driven command post exercises (CPX) as an economical and convenient means of training. The overall realism of this method of training relies heavily on the capabilities of the control staff, who must act as key personnel in the units at echelons above, below, and adjacent to the training audience. The controllers must generate a stream of realistic tactical messages, while attending to a myriad of other duties that place demands on their time. Further, this task is not well supported by the current generation of battle simulations. Automating the production of realistic messages is one solution to the problem. This report examines whether experienced Army officers can distinguish between messages produced in a CPX and FTX environment and investigates the characteristics of the messages that contribute to successful identification. The research will identify requirements for a system to automate the translation of simulation output into realistic messages.

TR 876 A Knowledge Elicitation Study of Military Planning, Thordsen, M.; Galushka, J.; Klein, G.A.; Young, S.; Brezovic, C. February 1990. (AD A219 969) The Critical Decision Method (CDM) has been developed as a knowledge elicitation tool for probing proficient decision making. This report describes the use of CDM during three different Division, Battalion, and Brigade-level planning exercises at Ft. Leavenworth, Ft. Riley, and Ft. Hood. CDM was successfully applied in each case. The third exercise, a computer-driven activity at Ft. Hood, used the Army Battle Training Simulator System (ARTBASS). It was the most complex and realistic of the exercises, and the CDM was supplemented by tapes of the operations planning activity. A microanalysis performed on these data generated 64 planning segments during a 5-hour period. The data showed a number of

features of the operations planning process. Almost 93% of the information types used were directly accessible; there was little searching for additional information and not a single instance where data on enemy action were sought from S2 (Intelligence). In addition, most decisions were handled through recognition strategies; in only 1 of 27 decisions was there a comparative evaluation of several options. The analysis of results was used to recommend features of training programs and decision support systems. In addition, a clearer concept emerged for using the CDM in conjunction with other data-gathering and analytic techniques.

TR 877 05H (Morse Intercept Operator) Performance: An Exploratory Study

Knapp, B.G.; Carter, F.L.; Hagerdon, R.A. February 1990. (AD A221 554) This project was designed to help the U.S. Army Intelligence Center and School (USAICS) identify and measure the characteristics of successful Morse Intercept Operators (MOS 05H) in order to improve personnel utilization and performance. Characteristics of operators were identified and standardized tests matched to the characteristics. Tests were given to field and student samples and related to performance on available criteria. The new test measures were powerful in predicting field performance but less so in determining academic performance. Learning rate was better predicted than course attrition. It is suggested that follow-on efforts be directed to attrition rather than new measures validation.

TR 878 A Survey of Human Factors Methodologies and Models for Improving the Maintainability Design of Emerging Army Aviation Systems, Ruffner, J.W. February 1990. (AD A221 159) This report presents the findings of a literature review conducted to identify human factors methods and models that might be used to improve the maintainability of emerging

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Army aviation systems. Three methods and seven models are reviewed. The three methods are Logistic Support Analysis, Hardware versus Manpower, and Acquisition of Supportable Systems Evaluation Technology. The seven models are the Human Operator Simulator, Microcomputer Systems Analysis of Integrated Networks of Tasks, Sequiturs Workload Analysis System, Task Analysis and Workload, Maintenance Personnel Performance Simulation, Crew Chief, and Profile. A comparison of the methods and models suggests that the Crew Chief and Profile models have the greatest immediate use for improving maintainability design. It is recommended that research be initiated that will (a) evaluate the Crew Chief and Profile models to see if they can be applied to the maintainability design of Army aviation systems; (b) investigate ways in which the other models might be modified and applied to Army maintainer tasks; and (c) begin a program of maintainability research to address Army aviation systems, mission requirements, and operational environments.

TR 879 Dimensions of Army Commissioned and Noncommissioned Officer Leadership, Steinberg, A.G.; Leaman, J.A. February 1990. (AD A224 933) This paper identifies the dimensions of Army commissioned and noncommissioned officer leadership. Results are based on the responses of 10,978 commissioned and noncommissioned officers (NCOs) to the 560 leadership tasks in the Army Leader Requirements Task Analysis Survey. The survey was developed from over 200 interviews with Army leaders. Factor analyses were performed first for the officers and NCOs together and then for each group separately to determine the most meaningful solution. The two separate factor analyses were preferable because each accounted for more of the variance than did the combined factor analysis. In addition, the combined solution masked similarities and differences be-

tween officers and NCOs. Nine factors emerged for the officers, and ten factors for the NCOs. The two factor solutions are compared and the results are discussed in terms of existing literature on leadership dimensions and current Army doctrine.

TR 880 The Family Adaptation Model: A Life Course Perspective, Bowen, G.L. February 1990. (AD A221 058) This research supports *The Army Family Action Plans (1984-1989)* by developing a conceptual model of factors that influence the adaptation of service members and their families to the demands they face from occupying social positions within three life domains: work, family, and community. The development of the family adaptation model is the result of a number of inter-related activities that include literature reviews, secondary analysis of available datasets, expert/user consultations, and field visits to conduct individual and focus-group interviews with soldiers, family members, Army leaders, and service providers. The model will be refined through subsequent research activities.

TR 881 The Impact of Advanced Technology on the U.S. Military, Verdugo, N.; Babin, N.E. February 1990. (AD A220 181) This paper focuses on the impact of advanced technology on three areas of the military organization: manpower, training, and human factors. Military technology has undergone rapid changes and the military organization has experienced changes in occupational structure, training technology, and manpower requirements. High technology has generated interest in issues such as the impact of advanced technology on small unit cohesion, de-skilling in the operation or maintenance of high-tech weapon systems, and development of new training programs for advanced military technology. The changing nature of warfare and how these changes will require a varying range of technological weapons and

equipment are also discussed. Additionally, the authors suggest an approach for empirical investigation of the relationship between technology and the military.

TR 882 Relationship Between Vehicle Identification Performance and the Armed Services Vocational Aptitude Battery, Heuckerth, O.H.; Smith, N.D.

March 1990. (AD A221 558) The development and testing of training programs for combat vehicle identification was conducted from 1980-1986 under the Target Acquisition and Analysis Training System (TAATS) work unit at Fort Hood, Texas. During that time 5 independent research projects were completed. This research evaluated the programs as well as a variety of factors related to training program performance, e.g., motion, alternate media, retention, and repeated training. The Manpower and Personnel Integration (MAN-PRINT) initiative motivated the exploration of the magnitude and validity of relationships between Armed Services Vocational Aptitude Battery (ASVAB) and vehicle identification performance. Comparable vehicle identification performance data from those efforts exist for 942 soldiers; ASVAB scores and vehicle identification performance data from those efforts exist for about 600 soldiers. These relationships were examined using (1) unweighted Pearson correlations; (2) correlations of performance with individual differentially weighted ASVAB scores; (3) multiple correlations involving different ASVAB scaled scores and subtests; and (4) discriminant analyses to predict high and low achieving soldiers. Researchers found (1) correlations based on equally weighted scores for individual ASVAB scaled scores and subtests are in the high .20s and low .30s, (2) when ASVAB scores for individual scaled scores and subtests are differentially weighted, modest increase (of about .05) in the absolute value of the correlations may be obtained, (3) multiple correlations involving more than one ASVAB

scaled score or subtest are comparable to correlations obtained by the differential weighting of scores for individual ASVAB scaled scores and subtests, (4) soldiers who will score "high" or "low" in vehicle identification performance can be identified in advance about 75% of the time by using quadratic discriminant functions involving ASVAB scaled scores, and (5) supplementary analyses involving use of random sample halves generally confirm the validity of relationships reported.

TR 883 The Incremental Validity of Spatial and Perceptual-Psychomotor Tests Relative to the Armed Services Vocational Aptitude Battery, Busciglio, H.H.

March 1990. (AD A220 903) This research evaluates the utility of new Army tests of spatial, perceptual, and psychomotor abilities developed under the Army's Project A (Improving the Selection, Classification, and Utilization of Army Enlisted Personnel.) Utility is judged in terms of incremental validity over the Armed Services Vocational Aptitude Battery (ASVAB). The analyses are stepwise regressions using predictors and performance tests from the 1985 Concurrent Validation of Project A. A variety of performance measures, ranging from comprehensive to task-level, served as criteria for the analyses. In the analyses, optimal combinations of Project A predictors substantially augmented the proportion of criterion variance explained by optimal combinations of ASVAB scores alone, particularly for such comprehensive measures as General Soldiering Proficiency and the combined score on written tests of school and job knowledge. In certain Military Occupational Specialties (MOS), Project A scores led to increments in the predictability of more specific criteria, such as Target Identification and Navigation. While no strong support was found for the relative superiority of spatial versus perceptual-psychomotor scores, there was evidence that some individual tests (viz., Assembling Objects, Figural Reasoning, and

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Target Identification) were much more useful than others as incremental predictors of the criteria. Because of the concurrent design used and the lack of opportunities for cross-validation, these generally favorable findings only suggest the results to be expected from Longitudinal Validation of Project A.

TR 884 Human Factors Research in Aircrew Performance and Training:

1989 Annual Summary Report, McAnulty, D.M. (ed.). March 1990. (AD A221 657)

This report presents summary descriptions of the research projects performed by Anacapa Sciences, Inc., for the U.S. Army Research Institute Aviation Research and Development Activity (ARIARDA) at Fort Rucker, Alabama, under contract no. MDA903-87-C-0523, entitled "Human Factors Research in Aircrew Performance and Training." From 9 October 1988 to 8 October 1989, Anacapa personnel worked on 31 research projects and 4 technical advisory services in emerging aviation weapon systems design, manpower and personnel programs, aviator training, and aviation safety research. The summary description for each project and technical advisory service contains a background section that describes the rationale for the project and specifies the research objectives; a research approach section that describes the tasks and activities required to meet the project objectives; a research findings section or, in case of developmental activities, a research products section; and a project status section that describes projections for future research, if any.

TR 885 Vulnerability Assessment of the M1 Tank to Future Battlefield Threats (SECRET/NOFORN: Unclassified title and abstract), Emerson, J.D.; Roach, J.D.; Schick, M.O.; Schultejann, P.A. March 1990. (AD C958 256)

This report examines the effects of possible "future" weapons and their impact on the operational performance of the M1 series main battle tanks. Informa-

tion presented in this report was gathered from the literature and from interviews with subject matter experts and analyzed against the currently postulated threats in a number of weapons categories. With few exceptions, the M1 was deemed to be not at risk to the effects of the "future" weapons that could reasonably be expected to appear on the tactical battlefield. To protect the M1 tank crews, the most fragile part of the weapons system, increased attention will have to be devoted to the development of new doctrine for the employment of heavy forces.

TR 886 Methodology for Defining and Sampling From the Domain of Threat Conditions for Crew and Platoon

Tactical Gunnery, Campbell, R.C.; Campbell, C.H. March 1990. (AD A221 094) The objective of this study is to develop and test a strategy for organizing potential threat target arrays and engagement conditions (i.e., a threat domain) to measure tank gunnery training objectives. Analysis was conducted to identify the categories of information required when specifying the threat. Procedures were then developed to ensure that the categories were comprehensive, and to systematically reduce the categories to a manageable and realistic level of specific threat arrays. These procedures, which include seven activities, form the methodology. To determine the usefulness of the activities as a methodology, a tryout using projected threat capabilities was conducted by staff. The proposed threat determination methodology provides a framework that ensures comprehensiveness in the consideration of the dimensions in the threat domain. The seven activities provide a path for defining and specifying a threat-based scenario and adjusting that scenario to differing threat sizes and capabilities within an encounter.

TR 887 Canceled.

TR 888 Strategies of Computer-Based Instructional Design: A Review of Guidelines and Empirical Research, Terrell, D.J. May 1990. (AD A224 038) A survey of literature was conducted to examine empirical research for the numerous guidelines and recommendations that have been published about design strategies for computer-based instruction. The guidelines and experiments were categorized as pertaining to (a) strategies for presenting instructional material, (b) strategies for questioning and interactivity, or (c) strategies for programming response feedback and remediation procedures. Strategies for presenting instructional material were analyzed in literature on orienting instructions and objectives, stimulus display duration, sequencing instructional material, sequencing levels of difficulty, graphics, and review of material. Strategies for questioning and interactivity were analyzed in literature on prelesson questions, question types, question placement, number of questions, and answering questions. Strategies for programming response feedback and remediation procedures were analyzed in literature on feedback for correct and incorrect responses, latency of feedback, and placement of feedback. Each guideline was classified according to whether authors of instructional guidelines made recommendations that contradicted the guideline, and whether empirical research supports the guideline, contradicts the guideline, or does not exist to evaluate the guideline. Very few of the guidelines are supported by empirical research or agreement among experts. Most of the guidelines are contradicted by other guidelines and are insufficiently supported by research. Instructional design guidelines requiring further research are identified.

TR 889 Delayed Entry Program (DEP) Attrition: A Microdata Model, Nelson, A.; Kearn, C.E. May 1990. (AD A223 800) Attrition from the Delayed Entry Program (DEP) is a continuing problem for the

U.S. Army Recruiting Command. Previous research on DEP attrition has suffered from small sample size, systematic sample bias, and the omission of economic variables. This research builds on previous efforts, correcting their shortcomings. It uses a binary logistic regression approach to estimate the effects of personal characteristics, recruiting policies, and economic conditions on DEP loss. The estimates indicate that conditions and personal characteristics significantly influence DEP loss. We also find that recruiting policies variables, although small, have a significant impact.

TR 890 Family Annualized Cost of Leaving (ACOL): The Household as the Decision Unit in Military Retention, Hogan, P.F. May 1990. (AD A224 394) This research supports the *Army Family Action Plans* (1984-1989) by developing a Family Annualized Cost of Leaving model that describes the costs and benefits associated with retention. Although approximately 55% of Army members are married and roughly half of the nonmember spouses work in the marketplace, models of Army reenlistment behavior such as the Annualized Cost of Leaving (ACOL) model have typically focused on individual members as decisionmakers. Focus on the individual service member omits important family factors affecting retention decisions. A model of Army reenlistment behavior with the family or household as the focal point in the decision process was developed. Army families are assumed to reenlist or leave to enter the civilian sector based on the market earnings opportunities of the service member and the market earnings and the value of nonmarket activities for the spouse. In particular, the cost to the Army family imposed by certain aspects of military life, such as Permanent Change of Station (PCS), on the earnings opportunities of the nonmember spouse was estimated. This measure, along with other factors, was entered into reenlistment equation. The notion

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of labor market rent, or consumer surplus, was developed to measure the potential loss to the family. Some spouses choose to work in the marketplace while others work in nonmarket home production activities. Both of these activities are valued by the household. Hence, differences in the spouse's market earnings because of military life may be a misleading indicator of differences in welfare. Calculation of the difference in spouse labor market rent, rather than earnings, ensures that nonmarket activities of spouses are not valued at zero. The loss in spouse labor market rent was estimated from a three equation model of spouse labor supply behavior using data from the 1985 DoD Member and Spouse Survey. The effect of frequent moves and other factors of military life of the spouse's wage is estimated from a spouse wage equation corrected for self-selection bias. The expected wage, based upon spouse characteristics was included in the labor supply equation, which is estimated as a two-limit tobit model. A measure of the loss in spouse labor market rents was calculated from the three equation model of labor supply and included in the family reenlistment equation. The reenlistment equation is estimated from a sample of Army male enlisted members from the 1985 DoD Survey. From the wage equation, it was found that a 1-month increase in the average time that a spouse spends at a given location in a year is associated with a 1% increase in the wage. From the labor supply equation, it was found that a 10% increase in the spouse wage is associated with a 12% increase in weeks worked, for those spouses already working, and about a 5% increase overall. A working nonmember spouse loses approximately 10 weeks of work, other things being equal, if the family makes a PCS move during the year. The regression results from the reenlistment equation provide evidence generally consistent with the family model of reenlistment behavior. The estimated parameters imply that a \$100 decline in the loss of spouse rents will increase the

probability of reenlistment by about 3%. This implies a reenlistment rate elasticity of about -.12 with respect to the loss in rent. In contrast, a \$100 increase in the member's Army pay will increase the probability of reenlistment by about 1% suggesting a reenlistment elasticity with respect to member's pay about 1.3. A simulation of this systems of equations suggests that a 12-month increase in the average tour length, reducing PCS move frequently by about 24%, would result in an increase in spouse wages of about 6% on average. The resulting decline in the loss of spouse labor market rent will increase the probability of reenlistment by about 3%, on average. The family ACOL model explains more fully the costs and benefits associated with retention for married Army personnel. It provides a more precise estimate of the effects of traditional variables included in the retention equation and reduces the possibility of biased estimates on these traditional variables. This model will aid in policy formulation by providing a direct quantitative link between measurable factors affecting the family, particularly factors affecting family income through nonmember spouse employment, and the decision to remain in the Army.

TR 891 An Evaluation of Signal Pre-Command Course Training Requirements, Legree, P.J.; Shipman, M.G.; Chappell, L.G.; Sanders, M.G.; Peardon, T. May 1990. (AD A224 802) The responsibilities of signal commanders have evolved from a predominantly tactical orientation to an orientation between the command of Tactical and Information System Command (ISC) units. This evolution necessitated a training requirements analysis for the Signal Pre-Command course (PCC). Thirty-nine recent graduates of the course, including both Tactical and ISC commanders, were surveyed to conduct a training analysis. The survey was designed to estimate for each of 104 command tasks the frequency at which a task was performed, the

importance of the task to mission success, and the adequacy of the commanders' preparation to perform the task. The survey data determined that the Tactical and ISC commanders should be instructed separately and identified the tasks that should be included for each group. The project demonstrated that the survey data can be used by the Signal School to effectively and quickly develop course material.

TR 892 Army Synthetic Validity Project: Report of Phase II Results, Volume 1, Peterson, N.G. (ed.); Hoffman, R.G. (ed.); Arabian, J.M. (ed.); Whetzel, D.L. (ed.). June 1990. (AD A226 355) The two major objectives of the Army Synthetic Validity Project are to identify and evaluate procedures for (1) identifying an optimal composite of selection measures for any Army enlisted Military Occupational Specialty (MOS) and estimating the validity of this composite for predicting job performance, and (2) setting a minimum qualifying score to assure a reasonable probability of successful job performance, as well as other appropriate cutting scores for other critical selection decisions (e.g., for selecting recruits with potential for outstanding performance). A major goal in Phase II for synthetic validation was to replicate and extend Phase I procedures for generating synthetic prediction equations for seven MOS. Four job component models (consisting of tasks, activities, attributes, and a hybrid of tasks and activities) were used to obtain job description judgments. Predictors were linked via expert judgment to the job components. Various ways of generating prediction equations were investigated. A second goal was to evaluate differences in the job descriptions generated by different types of judges. A major goal in Phase II standard setting was to refine the three different methods for setting performance standards. Three standard-setting methods reflecting performance on tasks, critical incidents, and by soldiers were used to obtain component standards. Again, we collected

judgments for combining the component standards.

TR 893 Design of a Threat-Based Gunnery Performance Test: Issues and Procedures for Crew and Platoon Tank Gunnery, Hoffman, R.G.; Fotouhi, C.H.; Meade, G.A.; Blacksten, H.R. June 1990. (AD A226 356) Threat-based gunnery performance testing procedures were developed using a seven-step process that included (a) describing the tank gunnery domain, (b) determining general test requirements, (c) analyzing gunnery outcome (speed and accuracy) measures and developing a recommended approach, (d) analyzing gunnery process measures (e.g., target acquisition, fire commands) and developing a recommended approach, (e) setting standards, (f) analyzing devices and making recommendations, and (g) developing test administration procedures. The test comprises (a) crew and platoon skill echelons, (b) Combat Tank Tables and threat-based target arrays, and (c) live fire and instrumented dry fire. After reviewing several alternatives, the hit expectation ratio metric that underlies Tank Table VIII was identified as the most conceptually complete outcome metric available. A spreadsheet format was prepared for extending the calculation of hit expectation ratio for crew gunnery for three, four, and five threat targets in an array. The mathematics of a suggested solution for calculating a platoon gunnery hit expectation ratio were presented. To support assessment of the behaviors and activities of crew and platoon gunnery, a series of descriptive rating scales were developed. A content evaluation of live fire and dry fire instrumentation systems was conducted to make recommendations for each of the eight components of the gunnery test. Live Fire Tables VIII and XII were included in the gunnery test without modification. This segment of the criterion test anchors the test by (a) providing familiar information that is readily accepted, and (b) allowing for the comparison of

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results with previous results with previous research findings. The remaining portions of the test extend data collection to additional types of engagements and to gunnery skills that are not well-suited to live fire safety constraints. Tank Weapon Gunnery Simulation System (TWGSS) was identified as the preferred dry fire instrument; however, it is not yet available. As an alternative, Precision Range Integrated Maneuver Exercise (PRIME) was recommended to support measurement of the aspects of gunnery that are not well-suited to live fire.

TR 894 Development of a Hypermedia Foreign Language Vocabulary Learning Environment, Swartz, M.L. June 1990. (AD A227 280) This report describes a theoretical framework for teaching military-specific foreign language vocabulary to Army soldiers. The theoretical framework relies on the psychological organization of lexical memory and the pedagogical principle of presenting new vocabulary in discourse contexts. Development of a prototype learning environment is described and a research plan to evaluate the system is proposed.

TR 895 The Comparability of an Armor Field and SIMulation NETworking (SIMNET) Performance Test, Smith, S.E.; Graham, S.E. June 1990. (AD A226 353) The high costs and number of problems associated with field testing have prompted the use of simulators for performance testing. This report assesses the Simulation Networking (SIMNET) system as a cost-effective soldier evaluation device by comparing soldier performance on field and SIMNET tests using the multitrait-multimethod matrix and analysis of variance technique. These tests were developed for use in the Soldier Performance Research Project (SPRP), which tested 120 tank crews on tactical skills. Soldiers also rated the similarity of performing the tasks on SIMNET and performing them on M1 tank. The com-

mand and control (C2) and communications performance dimensions exhibited acceptable levels of internal consistency and correlated significantly across the two methods. Low levels of reliability for the position location and combat driving dimensions appear to be due to the low number of items composing those dimensions. Soldiers rated the performance of tasks on SIMNET to be similar to the performance of tasks on the M1 tank. Results are encouraging for the use of SIMNET as a performance testing device for C2 and communications skills.

TR 896 Optimization of Simulation-Based Training Systems: Model Description, Implementation, and Evaluation, Sticha, P.J.; Buedo, D.M.; Singer, M.J.; Gilligan, E.L.; Mumaw, R.J.; Morrison, J.E. June 1990. (AD A227 249) A model for the optimization of simulation-based training systems (OSBATS) was developed using a systematic, top-down design procedure. The model consists of five tools that address the following problems: (a) determining which tasks should be trained by part-mission devices, full-mission simulators, or actual equipment; (b) specifying instructional features needed to train a set of tasks efficiently; (c) specifying the levels of fidelity that should be provided along several fidelity dimensions in order to meet task training requirements and satisfy cost limits; (d) determining the family of training devices that can train all required tasks at minimum cost; and (e) determining the optimal allocation of training time to training devices, given constraints on device use. The tools share common data on task requirements, training device features, and costs. A prototype decision support system (DSS) was developed and a formative evaluation conducted. The model was demonstrated on Army rotary-wing aviation tasks, and specifications for application to armor maintenance were developed. The report describes the model using the IDEFO (Integrated Computer-Aided Manufacturing Defi-

nition) system modeling language. In addition, the model is described for an example problem from a user's perspective. The example problem illustrates the way that the OSBATS model organizes the decision process, the kinds of analyses that can be performed, and the kinds of output that are produced. It was concluded that the prototype provides an adequate interactive environment in which the developer can perform several kinds of tradeoff analyses. The OSBATS software includes the data necessary to use the model for certain problems in Army rotary-wing aviation.

TR 897 Specifying Skill-Based Training Strategies and Devices: A Model Description, Sticha, P.J.; Schlager, M.; Buede, D.M.; Blacksten, H.R.; Epstein, K.

June 1990. (AD A227 237) This report describes the background and specifications of a model that identifies the skills required for competent performance of a job, specifies strategies for training those skills, defines training devices, and evaluates efficient use of skill-based training devices. The framework addresses three benefits of skill training: (1) skill training provides more practice on critical skills in a given amount of time, (2) critical skills generalize to many tasks, and (3) training the critical skills involved in complex and difficult tasks decreases the mental workload required to learn or perform tasks. Both a formal model and a concrete example of the steps derived from that theoretical approach in the context of the Air Traffic Control job domain are described. The specification of training strategies and devices is broken into four steps: identifying skills, selecting instructional strategies, designing devices, and allocating training. First, tasks are reduced to their elements to identify the general abilities and domain-specific skills required. Second, skills are grouped and sequenced for training. Third, device interface and instructor support requirements are derived for the target skills.

Finally, the projected cost of task training is compared to task training supplemented by the proposed skill training.

TR 898 The Army Leader Requirements Task Analysis: Commissioned Officer Results, Steinberg, A.G.; Leaman, J.A.

June 1990. (AD A226 543) This paper presents the method developed to identify the leadership portion of the job for Army commissioned officers, and the results obtained using this method. The approach used was a task analysis designed to: (a) encompass both officer and NCO leadership, (b) allow comparisons across ranks, branches, and type of officer, and (c) be compatible with an existing Army system. The task analysis instrument was empirically developed and tailored to Army leadership. The task list consisted of 560 leadership tasks, divided into 20 individual duty areas. The individual duties encompass four broad areas: Train, Teach, and Develop; Motivate; Resource; and Provide Direction. The results from administering the task analysis instrument to 5,033 commissioned officers are presented both as responses to individual tasks and patterns across different areas within leadership, as a function of rank, branch, type of organization, and designated leadership position.

TR 899 Designing a Gunnery Training Strategy, Morrison, J.E.; Holding, D.H.

June 1990. (AD A226 129) This report is one in a series that examines the development of research tools to support this research. The focus of this research was to develop methods for designing a gunnery training strategy. A training strategy was defined as any method for configuring instruction to enhance learning and/or reduce training costs. However, this report was limited to the discussion of methods that address the following key functions of training strategies: (a) organizing training objectives into units of instruction, (b) sequencing training both within

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and among units of instruction, (c) selecting the appropriate training device or medium for each unit, and (d) allocating training time to each unit/device combination. The training strategy methods were first discussed in terms of their theoretical rationale and usefulness for gunnery training. The methods were then tested by applying them to two prototypical problems in gunnery training: (1) the use of two different devices for training similar basic gunnery skills, and (2) the use of multiple devices to train the dissimilar skills in platoon gunnery. The application of methods for designing a training strategy demonstrated, in general, that the various methods can be applied to dissimilar gunnery training problems with sensible results. Only one of the methods failed to apply to both problems—the methods for allocating training time were not able to handle the more difficult multi-device tactical training problem.

TR 900 Crew Performance Associated with the Simulation of the Commander's Independent Thermal Viewer (CITV), Quinkert, K.A. July 1990. (AD A226 890) The Commander's Independent Thermal Viewer (CITV) is a high priority component of the Block II preplanned product improvements (P3I) for the Abrams main battle tank. Army developers have predicted that this addition will enhance the fightability of the tank by providing increases in target acquisition with greatly decreased times. These predictions are based on combat models and do not include consideration of the operator performance in the assessment of the system. This report presents the results of an experimental effort that incorporated an interactive simulation of the CITV into the Unit-Conduct of Fire Trainer (U-COFT). This effort provided soldier-in-the-loop information about the operational effectiveness of the system. Additionally, it addresses potential changes in training, and provides soldiers' comments on soldier-machine interface.

TR 901 Scale Development for Enlistment Motivation Measures,

Baker, T.A. July 1990. (AD A227 235) Using the New Recruit Survey, this research developed multi-item scales to assess the importance of various factors in a recruit's decision to enlist. The data were collected from 1986 to 1989. The items were grouped into seven factors for the Active Army and eight factors for the Reserve Components. Factors common to both samples include: self-improvement, education money, job skills, soldiering, benefits, and women's opportunities. The scales were examined for reliability and items that did not relate highly to other items were deleted. After the deletions the reliability was less than the acceptable level of .70 for five of the seven Active Army scales and four of the eight Reserve Components scales. Scale means found self-improvement to be considered most important, followed by education money and job skills. A number of scale differences were found across demographic variables. Issues that may influence the reliability of scales and recommendations for increasing scale reliability are presented.

TR 902 Enlisted Personnel Allocation System: Final Report, Konieczny, F.B.; Brown, G.N.; Hutton, J.; Stewart, J.E.

II. July 1990. (AD A229 095) The U.S. Army Research Institute for the behavioral and Social Sciences, with the assistance of the General Research Corporation, undertook a project to modernize and improve the way the Army determines an individual's military Occupational Specialty (MOS) at time of enlistment. Researchers developed the Enlisted Personnel Allocation System (EPAS). This report is the final report for the EPAS project. It summarizes the key research issues and findings resulting from this effort.

TR 903 Canceled.

TR 904 Research and Development on the Characterization of Simulation-Based Training Systems: Project Executive Summary, Sticha, P.J. July 1990. (AD A227 361) For this project, researchers developed a model for the optimization of simulation-based training systems (OSBATS) using a systematic, top-down design procedure. The model consists of five tools that address the following problems: (a) determining which tasks should be trained by part-mission or full-mission simulators and which should be trained on actual equipment; (b) specifying which instructional features are needed to train a set of tasks efficiently within a budgetary constraint; (c) specifying the optimal levels at which fidelity should be provided along several fidelity dimensions to meet training requirements and satisfy a training-device cost limit; (d) determining the group of training devices that can train all required tasks at the minimum cost; and (e) determining the optimal allocation of training time to training devices, given constraints on device use. The tools share a common database of task requirement, training device, and cost data. A prototype decision support system (DSS) implementing the OSBATS model was developed and formative evaluation of the model and software conducted. The model was applied to a problem in Army aviation, and specifications for its application to armor maintenance were developed.

TR 905 Human and Computer Task Allocation in Air Defense Systems, Cohen, M.A.; Adelman, L.; Bresnick, T.A.; Chinnis, J.O., Jr.; Laskey, K.B. August 1990. (AD A229 056) The first task of the Phase II research involved additional analysis of the Phase I experimental data with the goal of developing models of operators' information-processing strategies when using different human-computer interfaces, and the relationship between those models and performance. The second task involved: (1) the development

of a representative, computer-based testbed for performing controlled, experimental research with actual U.S. Army air-defense operators; and (2) the performance of two experiments at Fort Bliss for testing (a) the relative effectiveness of alternative interfaces for supporting human-computer interaction, (b) the theoretical principles underlying the predictions, and (c) the ability to link information-processing strategies to performance. The research demonstrated the superior performance of interfaces that solved the relatively easier tasks and helped operators focus their attention on the relatively harder tasks under conditions of high workload. In addition, the research demonstrated the added value achieved by an operator-controlled allocation (i.e., rule creation) capability that permits the operator to instruct the system in how to perform certain tasks (i.e., identify targets). A direct relationship between operators' performance and their information-processing strategies was demonstrated for each interface.

TR 906 Teaching a Foreign Language Lexicon: A Rationale for Hypertext, Holland, M.V. August 1990.

(AD A228 374) Acquiring and retaining a large foreign language lexicon is difficult for military linguists, especially if the lexicon contains technical and military terms used on the job. The shortage of instructors to teach job-specific foreign language, as well as demonstrated shortcomings of available paper-and-pencil methods, has stimulated exploratory development of computer-based programs for foreign language learning. This report analyzes the problem of learning job-specific lexicons in a foreign language, addressing both practical and cognitive-theoretical aspects. It describes the U.S. Army Research Institute for the Behavioral and Social Sciences' (ARI's) in-house development of a series of computer programs for learning foreign language vocabulary, justifying the structure of each pro-

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gram in terms of cognitive needs identified in the problem analysis. In particular, the report shows how the choice of hypertext software as a learning environment and development tool supports the structure of expert and emerging lexical knowledge as demonstrated in cognitive and psycholinguistic research.

TR 907 The Determinants of Job Satisfaction in the U.S. Army Reserve/National Guard Units: A Multidisciplinary Analysis, Lakhani, H.A. August 1990. (AD A229 014) This research reports an empirical analysis of job satisfaction in the U.S. Army Reserve/National Guard units. Job satisfaction is explained in terms of an economic theory of the effect of pay, the psychological theory of commitment and motivation, and a sociological theory of positive interdependence of work life and family life. Data from an Army Experience Survey, 1985, were developed to obtain 10 factors that were used to predict job satisfaction in a logit model of job satisfaction. The results revealed that, as expected, job satisfaction was explained by variables from all the three disciplines. In particular, job satisfaction was related positively to an increase in pay, positive job experience, perceptions and realizations of schooling/training motive, and soldiers' satisfactory relationships with spouses and children. Job satisfaction was related negatively to an increase in dissatisfaction with the job environment, uninteresting work, long working hours, and unfair treatment.

TR 908 The Army Leader Requirements Task Analysis: Noncommissioned Officer Results, Steinberg, A.G.; Leaman, J.A. August 1990. (AD A228 296) This paper presents the methods developed to identify the leadership portion of the job for Army noncommissioned officers and the results obtained using these methods. Researchers used a task analysis instrument designed to: (a) encompass both officer and NCO

leadership, (b) allow comparisons across ranks, branches, and type of officer, and (c) permit comparison with an existing Army system. The task analysis instrument was empirically developed and tailored to Army leadership. The task list consists of 560 leadership tasks, divided into 20 individual duty areas. These individual duties encompass four broad areas: train, teach, and develop; motivate; resource; and provide direction. The results of administering the task analysis instrument to 5,945 noncommissioned officers are presented in terms of responses to individual tasks and patterns across different areas within leadership as a function of rank, branch, type of organization, and designated leadership position.

TR 909 Performance Utility and Optimal Job Assignment, Nord, R.D.; White, L.A. September 1990. (AD A229 106) The Army is currently conducting a long-term research project to improve the ability to predict enlisted soldier performance. Also, a new Enlisted Personnel Allocation System (EPAS) is being developed to enhance the effectiveness with which performance information is used to match recruits with Army MOS. To maximize the payoff to the Army of the available manpower pool, the assignment system must consider not only the *level* at which a recruit will perform in different jobs, but also the *utility* to the Army of each potential combination of performance level and job. This paper describes a series of simulations undertaken to assess how different models of performance utility will affect the manpower distributions produced by an optimal assignment system. The results show that (a) the use of performance utility in optimal assignment can produce performance gains equal to those achieved when utility is ignored, while simultaneously providing a more balanced distribution of performance across jobs; and (b) specifications in which performance value depends on the main level of performance seem

to produce better results than those that assume constant marginal value.

TR 910 Deceiving the Opposing Force (OPFOR): A Program of Theoretical and Applied Research to Aid the Deception Planner, Zakland, A.L.; Zachary, W.W.; Hicinbothom, J.H.; Broz, A.L.; Knapp, B.G. September 1990. (AD A228 942) The concept of battlefield deception was developed using a hierarchical framework, a cognitively based decision model, and an act-react cycle to illustrate battlefield flow to help deception planners understand intentions and expected observables. Based on identified gaps in the current doctrinal planning process, a PC-based battlefield activities analysis tool (BAAT) was designed. The explication of the planning process, U.S. and Soviet decision cycles, and the BAAT system provide a set of products and tools to enhance U.S. Army deception planning and doctrine development.

TR 911 Computer Simulation Modeling: A Method for Predicting the Utilities of Alternative Computer-Aided Threat Evaluation Algorithms, Ainsworth, J.S.; Kubala, S. September 1990. (AD A230 252) This report describes the development of a computer model that simulates air defense engagements between a platoon of Air Defense Anti-Tank systems (ADATS) and 20 aircraft. The model is programmed using SLAM II software and user-written FORTRAN inserts. Experimentation with the model yielded the necessary data for comparing the utilities of four computer-aided threat evaluation algorithms implemented in a target-rich environment. The model was run 100 times for each algorithm. The goal was to determine which of three experimental algorithms yielded results when using a more realistic but resource-intensive control algorithm. Experimental results provided support for using a target prioritization algorithm similar to

the one formulated by the manufacturer of the ADATS, Martin Marietta.

TR 912 Investigation of Psychomotor and Spatial Abilities in Simulated Air Defense Engagements, Gast, I.F.; Johnson, D.M. September 1990. (AD A229 649) This report documents research performed to evaluate the feasibility of using spatial and psychomotor tests developed for Project A for predicting engagement of aerial targets by two Air Defense Military Occupational Specialties. Data were collected from 26 16P (Chaparral) personnel and 75 16S (Stinger) personnel in their last week of advanced individual training at Fort Bliss. Predictor tests were administered nearly concurrently with criterion data collection in the Realistic Air Defense Engagement System (RADES). No relationship was found between spatial or psychomotor abilities and engagement performance. Possible explanations were discussed for the negative results, including limitations in sample size and limitations in experimental control necessitated by the need to provide a realistic simulation environment.

TR 913 A Meta-Analytic Approach for Relating Subjective Workload Assessments With U.S. Army Aircrrew Training Manual (ATM) Ratings of Pilot Performance, Stewart, J.E. II.; Lofaro, R.J. September 1990. (AD A230 127) In 1985 Lofaro, using a modified Delphi technique, had subject matter experts (SMEs) generate estimated ratings of the subjective workload imposed by various Aircrrew Training Manual (ATM) tasks for several Army helicopters, including the UH-60 Blackhawk. For each task, ratio-scaled estimates of difficulty and time to perform were derived. This research was performed to determine the validity of the UH-60 ATM estimates by correlating them with instructor pilot (IP) ratings of checkride performance from two other unrelated research

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projects. The other efforts investigated the decay of ATM task-related skills among Reserve and regular Army aviators. A second phase of this project compared the difficulty ratings of ATM tasks associated with UH-60 accidents over FY 1980-88 with those not associated UH-60 accidents. A negative correlation between the modified Delphi weights assigned to ATM tasks and IP ratings on these tasks was hypothesized; the hypothesis was confirmed. Analysis of the UH-60 accident data confirmed the second hypothesis: ATM tasks that were accident-related had significantly higher Delphi weights than ATM tasks not related to accidents. The report discusses practical applications of the modified Delphi technique, with an emphasis on enhancing aviation safety and improving training effectiveness.

TR 914 Research and Methods for Simulation Design: State of the Art,
Sticha, P.J.; Singer, M.J.; Blacksten, H.R.;
Morrison, J.E.; Cross, K.D. September
1990. (AD A230 076) This report reviews
the empirical results and analytical methods
available to the training-device designer for
tradeoff analyses necessary to produce cost-ef-
ficient training-device designs. It addresses
the problem of training system optimization
in three ways. First, it describes existing
methods that can aid training-device design
functions. The function and operations of
methods are compared to the model for the op-
timization of simulation-based training sys-
tems (OSBATS) developed for this project. Sec-
ond, it reviews research on several issues
related to training-device optimization. The is-
sues covered in the review include training-de-
vice fidelity, instructional features, skill acqui-
sition, skill retention, transfer of training, and
cost estimation. Third, the review organizes
the requirements for future research on these
topics and sets priorities for research topics
based on their cost and the benefit they could

offer to the training-device designer.

TR 915 Review of Command and Control Models and Theory, Crumley,

L.M.; Sherman, M.B. September 1990. (AD A230 105) This review examines command and control model and theory literature from 1975 to 1988. It identifies and discusses literature that discusses how command post staffs perform command and control functions and deliberately omits a fairly large body of literature that discusses tangentially related material. Reports that dealt with communications or seemed to address command and control as a vehicle to demonstrate the potential relevance of some existing engineering or operations research methodology are omitted. A total of 66 reports and documents are discussed. The literature has been classified into five basic types of models: (1) models that evolve from literature, such as field manuals (*implementational* in intent), (2) *organizational* models that evolve from adaptations of organizational or management theorists' work, (3) *behavioral system* models that look at command and control in terms of human behavior, (4) system-oriented models that emerge from systems research perspective, and (5) some attempts to develop *network-based* models by applying existing analytical techniques. The literature supports the following conclusions:

1. Models and theory that support a purpose beyond discussion of the model or theory itself are more productive than products that derive from attempts to develop models or create theory independent of a specific application.
2. Research that is based on an organizational or management theory perspective is more productive than research that evolves from other research perspectives.
3. Research that considers decision making as the role of a command post is more effective when it does not artificially, and incorrectly,

limit the decisions it considers to those implied in the military decision-making model. (The military decision-making model is used to explain how orders from next higher headquarters are evolved into orders by the echelon that receives them.)

4. No extant model is sufficiently well developed and supported by data that it can be used in a predictive or analytic fashion.

Beyond these conclusions, which clearly evolve out of considering the literature itself, there are other goals, or model and theory requirements, that should be adopted to provide guidance for the development of better models. These conclusions are partly drawn from literature and partly the result of considering, in a broader fashion, the problems associated with the potential acceptance and utilization by the Army of command and control research. These ancillary conclusions are as follows:

5. Models should deal with a specific organizational structure.
6. Models should be based on observable tasks, processes, or behavior.
7. Models should be constructed so that the data that support them and model outputs can be easily related to the tasks, processes, or behavior on which they are based.
8. Models should support a theoretical development to define how the command and control function relates to battle outcome and, thereby, permit command and control research to be of value in determining how battle staff activity contributes to unit fighting effectiveness.

TR 916 An Analysis of Skill Transfer for Tank Gunnery Performance Using TOPGUN, VIGS, and ICOFT Trainers, Turnage, J.J.; Bliss, J.P. October 1990.

(AD A231 156) This study was performed to determine (1) whether performance improves during part-task tank gunnery training on

TOPGUN and VIGS devices; (2) whether TOPGUN performance transfers to VIGS performance, and vice versa; (3) whether training performance on VIGS and TOPGUN transfers to gunnery performance on a high-fidelity training—the Institutional Conduct-of-Fire Trainer (ICOFT); (4) which sequence of training (TOPGUN-VIGS or VIGS-TOPGUN) shows better transfer to ICOFT; and (5) whether selected aptitude, ability, motivational, and demographic measures predict TOPGUN, VIGS, and ICOFT performance. Sixty student subjects were randomly assigned to three groups. Each group of 20 subjects was screened for colorblindness and completed a battery of predictor tests consisting of the VISTECH contrast for sensitivity test (four replications), the Automated Performance Test System (APTs, three replications), a short version of the Armed Services Vocational Aptitude Battery (ASVAB), and the Work and Family Orientation (WOFO) Questionnaire. The two experimental groups (TOPGUN-first and VIGS-first) received two training trials per day for 2 days on either TOPGUN or VIGS and then were switched to the alternate device for training on the following 2 days. Finally, all subjects received approximately 2.5 hours of familiarization and testing on the ICOFT and completed post-test opinion questionnaires. Results indicated that (1) performance improved at equal rates during TOPGUN and VIGS training; (2) there was significant transfer between most TOPGUN and VIGS performances, with no apparent superiority to either device; (3) except for speed measures, TOPGUN and VIGS training transferred to ICOFT; (4) there were no apparent differences between the TOPGUN-VIGS or VIGS-TOPGUN sequences of training; and (5) highly reliable predictor tests (e.g., code substitution and reaction time tests from APTs; contrast sensitivity test from VISTECH; and “auto and shop information” and “mechanical comprehension” from ASVAB proved to be the best indicators of gunnery performance on the

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various devices generally low multiple correlations.

TR 917 Sample Representativeness in the New Recruit Surveys: Seasonality Effects, Hay, M.S. December 1990. (AD A232 763) For this report, the researchers analyzed data from 2 years of the U.S. Army Recruiting Command (USAREC) New Recruit Survey (NRS) to see whether substantial seasonal variations in characteristics of accessions exist. Variables were selected for investigation based on preliminary Chi-square analyses conducted on 1 year of NRS data. Results indicate that Armed Forces Qualifying Test (AQQT) category, age at contract, sex geographic region, enlistment term, length of Delayed Entry Program (DEP), first contact with an Army recruiter, and circumstances of first contact appear to have substantial seasonal effects. Enlistment motivations and loss of enlistment incentives show some statistically significant differences across the year, but seasonal effects may not be of practical significance. Ethnicity, educational goals, plans to use the G.I. Bill, and hometown size do not seem to have seasonal patterns among new recruits. In general, for variables that are affected, the major contrast is between summer and winter accessions.

TR 918 Simulation-Based Assessment of Automated Command, Control, and Communication Capabilities for Armor Crews and Platoons: The Intervehicular Information System, DuBois, R.S.; Smith, P.G. January 1990. (AD A233 509) The Army is assessing the benefits of including an automated C3 display, the Intervehicular Information System (IVIS), in the upgraded Block II M1 Abrams tank. This simulation-based research compared the performance of 24 tank crews and 6 tank platoons using a prototype IVIS with the performance of 24 tank crews and 6 tank platoons using conventional C3 and navigational tools, in-

cluding a radio, paper map, protractor, and compass. The research supported including IVIS in future tank upgrades. Armor crews and platoons equipped with IVIS significantly outperformed the crews and platoons using conventional techniques on every composite measure evaluated. IVIS-equipped crews and platoons executed a C3 exercise and offensive and defensive combat missions faster, reported their own location and battlefield events better, and successfully executed more fragmentary orders than crews and platoons equipped with conventional tools. The findings also suggest critical Armor performance, training, and standard operating procedure implications and identify and reflect on IVIS system design and functional requirements.

TR 919 The Development of Content-Valid Performance Measures for the 76C Course and Field Assessment, Cormier, S.M.; Dressel, J.D.; Mirabella, A. January 1990. (AD A232 741) This report summarizes research on test development conducted as part of the Training Technology Transfer Program at Fort Lee. We developed a prototype, content-valid test battery for 76C (equipment records and parts specialist) prescribed load list (PLL) clerk personnel to evaluate the impact of new training methods and material for 76C MOS. The existing testing system in 76C MOS was found to be limited in several respects. For example, it did not ensure that actual job tasks were accurately sampled and represented on end-of-an-annex examinations. To overcome the limitations of the testing system, we compiled a model to produce test battery for 76C MOS that includes a sample of multiple-choice items and work sample exercises from the tasks in the PLL duty position. To test the battery, we administered it at three U.S. Army Forces Command (FORSCOM) sites. We also collected ancillary data (supervisor ratings and biographical information) to explore the usefulness of nontest data to evaluate soldiers

skills levels. We showed that the prototype battery is reliable but could be improved substantially by increasing the length of the multiple-choice portion. We also showed that the battery could be administered routinely without heavy resource demands and therefore could be used to assess the impact of new training methods. Neither ratings nor biographical information, e.g., job experience, correlated with test scores. The supervisor results highlight an organizational problem—76Cs are supervised by noncommissioned officer (NCOs) who may not be in a position to accurately evaluate 76C performance. Finally, the biographical data indicate that job experience is not necessarily a good indicator of skill.

TR 920 Transfer of SIMNET Training in the Armor Officer Basic Course, Bessemer, D.W. January 1990. (AD A233 198) Tactical training using networked tank simulators in the Armor Officer Basic Course allowed a quasi-experimental assessment of transfer to student officer performance in field training. Baseline classes without simulator training were compared in an interrupted time-series design to classes with simulator training. Regression analyses were performed on measures obtained from course records. Transfer of training was found using indicators of (a) the amount and type of field training conducted, (b) officer performance in leadership positions within student platoons, and (c) overall tactical leadership qualities shown by students as rated just prior to course graduation. Benefits of simulator training increased progressively in successive classes as the instructors "learned to train" using the simulators. The "learning to train" factor may often cause underestimation of the value of training devices. The report discusses implications for testing and evaluating military training innovations.

TR 921 Project A Spatial Tests and Military Orienteering Performance in the Special Forces Assessment and Selection Program, Busciglio, H.H.; Teplitzky, M.L.; Welborn, C. February 1991. (AD A233 432) This research assessed the relationship between scores on new Project A tests of spatial ability and performance in the Special Forces Assessment and Selection (SFAS) program, including military orienteering (i.e., navigating over unfamiliar territory from a drop-off point to a prescribed destination). Candidates in two SFAS classes took the Project A Map, Orientation, and Maze tests. Researchers also used tow measures of general cognitive ability and a measure of physical fitness as predictor scores. Criterion data were gathered as candidates proceeded through the SFAS program. The authors performed a series of univariate and multivariate analyses on these data. The major results indicate that (a) spatial scores are moderately related to scores on individual military orienteering tasks, (b) certain spatial test scores and scores on the Army Physical Fitness Test (APFT) lead to modest increases in the predictability of overall orienteering performance and graduation from the SFAS program, and (c) spatial, cognitive, and APFT scores do not lead to any appreciable improvement in the prediction of voluntary and involuntary attrition. The modest effects of our analyses indicate that SFAS performance is a function of spatial ability, physical fitness, and other, as yet unexplored factors. Although the research described in this report does not provide a sufficient basis for recommending the use of Project A spatial test as selection screens in the SFAS program, it does provide a basis for pursuing further research that might identify a role for these tests in the selection process.

TR 922 Army Synthetic Validity Project: Report of Phase III Results Volume 1, Wise, L.L.; Peterson, N.G.; Hoffman, R.G.; Campbell, J.P.; Arabian, J.M. February

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1991. (AD A235 635) The Army Synthetic Validity Project developed and evaluated a series of alternative procedures for (a) analyzing critical components of jobs, (b) obtaining expert judgments of validities of individual attributes for predicting critical performance components, (c) establishing prediction equations for specific jobs when criterion-related validation data were not available, (d) estimating criterion-referenced performance standards for specific jobs, and (e) specifying scores on the predictor battery necessary to achieve the desired performance standard, given the bivariate distribution between predictor scores and performance scores. The results and conclusions obtained for each of these activities follow. As a consequence of results obtained in earlier phases of the project, the attribute model and the job behavior method were set aside and the questionnaire based on tasks performed became the tool of choice. While all methods provided reliable descriptions the task questionnaire yielded greater discriminability across MOS and had higher acceptability among the judges. Judgments about the validity of human attributes for predicting job descriptor elements proved to be particularly robust across judges, who differed across a fairly wide range of relevant psychological training and experience. The synthetic validation methods produced equations that have only slightly lower absolute validities than least squares equations developed directly on the jobs, depending on the criterion and method of forming the synthetic equation. The most significant conclusion of the standard setting research was that the different methods developed and evaluated led to different results. Very strict standards were set when performance was described in terms of "percent go" scores on hands-on task performance tests. Researchers developed a computer program to demonstrate the linkage between test scores and acceptability levels. The program uses a database with the linkage relationships estimated for the MOS included in

this project. This database includes performance cut scores for each MOS and also regression slope, intercept, and error variance parameters. The user may vary additional parameters to obtain the percentage of recruits expected to perform at each level of acceptability. Other research related to this phase of Project A appears in ARI Research Product 91-08, Army Synthetic Validity Project: Report of Phase II Results. Volume II: Research Instruments.

TR 923 A Review of and Recommendations for Procedures Used to Evaluate the External Effectiveness of Intelligent Tutoring Systems, Legree, P.J.; Gillis, P.D. March 1991. (AD A236 625)
This report reviews and discusses intelligent tutoring system (ITS) evaluation standards and procedures. Three criteria evolved from the review and are proposed to accurately evaluate ITS product effectiveness. First, the instructional effectiveness of ITS application, human tutors, and traditional methods needs to be compared using performance data. Second, extensive ITS applications should be used to evaluate instruction effectiveness. Third, large groups of subjects must be used for the evaluations to precisely estimate ITS effectiveness.

TR 924 Initial User Assessment of the Operations Planning Tools, Perkins, M.S.; Flanagan, J.P.; Fallesen, J.J. April 1991. (AD A240 574) This report describes assessment of a decision aid called the Operations Planning Tools (OPT). OPT resides on the Tactical Planning Workstation. The assessment was conducted using a division-level offensive scenario set in the Federal Republic of Germany. Two experienced combat arms officers used OPT to develop and analyze tactical courses of action to perform the 3-day assessment. This document describes the assessment procedure and user feedback on the design and features of OPT. User reaction to

the concept and applications of OPT was favorable, and recommendations for future enhancements were identified.

TR 925 Development of a Measure of Family Adaptation to the Army, Orthner, D.K.; Zimmerman, L.I.; Bowen, G.L.; Gaddy, G.; Bell, D.B. April 1991. (AD A240 842) This research supports The Army Family Action Plans by developing a measurement model and a set of scales that identify the factors associated with family strengths and family adaptation to the military. It provides data on how to develop programs and services that assist families in making adjustments to military demands. The data for this report were collected from a randomly selected sample of 11,035 soldiers in 1989. The analysis was conducted on 6,706 married soldiers who were living with their spouses. Researchers developed a model of the relationships between family conditions, family strengths, and identified the appropriate variables associated with these constructs. They used structural modeling to analyze the data and optimize the fit between the proposed variables and the hypothesized relationships and constructs. Based on the final model, two scales were constructed. The family strengths scale indicates a family's ability to cope with demands. The family adaptation scale indicates the family's adjustment to organizational demands. The findings were interpreted in terms of their value to military researchers, service providers, and policy makers. Researchers can use the new measures to assess the strengths and adaptability of the military families in their investigations. Service providers can target specific factors to improve family wellness and adjustments. Policy makers can use the data to establish unit, installation, or service-wide policies that strengthen the abilities of families to meet their needs and adapt to military demands and contingencies.

TR 926 Computer-Mediated Processes in Distributed Command and Control Systems: Supervised Shared Work, Linville, J.M.; Liebhaber, M.J.; Obermayer, A.H.; Fallesen, J.J. April 1991.

(AD A240 922) This report describes research on the effects of computer-mediated communications on distributed command and control. The study extends the investigation of computer-mediated communication with shared graphics in distributed C2 to a three-person group (triad) to examine the effects of computer-mediation on the ability of a supervisor to interact with staff members and to exercise control over task accomplishment. An experiment was conducted that required two team members, under the supervision of a third individual, to collaborate on a military tactical movement order task. The three people were also required to perform other work to simulate conditions typical for command staffs. Work was performed face-to-face (FTF) and with the group separated using various modes of computer-mediated communications. The experimental modes evaluated were (1) face-to-face, (2) synchronous with voice communications (SYNCH+V), and (3) voiceless asynchronous electronic-mail communications (ASYNCH). Results indicate that little is lost in performance quality or speed when moving from face-to-face to computer-mediated communications with an auxiliary voice channel. There were notable time differences in the ASYNCH mode. The synchronous with voice mode was a more desirable supervisory mode than face-to-face or asynchronous modes.

TR 927 Integrated Knowledge Elicitation and Representation Framework, Leddo, J.; Cohen, M.S.; O'Conner, M.F.; Bresnick, T.A.; Freeman, M.F. April 1991. (AD A239 843) This report summarizes the results of a project designed to develop methods to elicit and represent expert knowledge. Previous work in knowledge elicitation/engineering has been largely applications-driven,

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with expert knowledge force-fit into predefined knowledge frameworks. The goals of this project were to gain insight into how experts structure knowledge, to develop and test a set of integrated knowledge-elicitation techniques driven by this understanding of expert knowledge representation and use, and to gain insight into the nature of expertise and how it develops. Knowledge-elicitation sessions were conducted with some fifty experts in order-of-battle analysis, situation assessment, target development, and collection management at Forts Bragg, Carson, Lewis, Hood, and Huachuca. Results indicate that experts use a diverse range of knowledge structures depending on their functional area, level of experience, unit, and other variables. These structures are used integratively rather than singly. As a result, we propose an Integrated Knowledge Structure (INKS) framework for expert knowledge representation. We found that using a diverse set of knowledge-elicitation techniques integratively elicits knowledge more completely than any single technique (such as think-aloud problem solving). We also found that the most experienced subjects reason primarily by causal analysis driven by their goals or objectives. Comparison of experts across different skills levels suggests several stages may occur in the development of expertise. These findings have implications for (1) the development of artificial intelligence, expert, and decision support systems that more closely model expert knowledge, (2) training people to become experts, and (3) evaluating the effectiveness of training by comparing student knowledge to expert knowledge.

TR 928 Costs and Errors in Survey Sample Design: An Application to Army Prospect and Recruit Surveys, Borghida, E.; Sullivan, J.L.; McGuire, D.P.; DuBois, D. April 1991. (AD A239 842) This report discusses the implications of survey costs and sampling errors for the design of

marketing, program evaluation, and sales satisfaction surveys used in Army recruiting. The first section gives an overview of relevant research on the recruitment process, describes survey populations at different stages of recruiting, and identifies major variables that affect sample designs and survey content. The second section examines the effect of seasonality on survey response and sampling and presents results of data analyses. The third section presents a general model of costs and errors in survey sampling for four stages of the recruiting process: initial appointments, applications, contracts, and accessions. The fourth section discusses application of the model to ongoing surveys at all four stages of the recruitment process. In particular, the costs, benefits, errors, applicability, and practicability of alternative sampling plans are described. This report is the first of two reports on this subject. The second (McGuire, 1991; in preparation) contains the User's Manual for a prototype Lotus 1-2-3 spreadsheet designed to examine tradeoffs between survey costs and sampling errors.

TR 929 Organizational Downsizing: Individual and Organizational Implications and Recommendations for Action, Kozlowski, S.W.J.; Chao, G.T.; Hedlund, J.A.; Walz, P.M. June 1991. (AD A237 243) For this report, a review of the organizational literature was conducted to compile current research and applied knowledge relevant to personnel or work force reductions. The review was performed to develop a reference resource for managing U.S. Army force reductions. More than 300 case, research, conceptual, and prescriptive sources were examined and a conceptual framework was developed. Major topics include (1) environmental constraints, organizational retrenchment, and targets of downsizing; (2) downsizing strategies; and (3) transition management, and intervention processes. Following the review, researchers identified issues encountered during previous

U.S Army demobilizations. Finally, recommendations were developed that considered important themes from the organizational literature, tempered by the unique requirements pertinent to U.S. Army force reductions.

TR 930 Human Factors Research in Aircrew Performance and Training:

1990 Annual Summary Report, McAnulty, D.M. June 1991. (AD A241 134) This report presents summary descriptions of the research projects performed by Anacapa Sciences, Inc., for the U.S. Army Research Institute Aviation Research and Development Activity at Fort Rucker, Alabama, under Contract No. MDA903-87-C-0523, entitled "Human Factors Research in Aircrew Performance and Training." During the period from 9 October 1989 to 8 October 1990, Anacapa personnel worked on 21 research projects and one technical advisory service in emerging aviation systems design, manpower and personnel programs, aviator training, and aviation safety research. The report also describes two research projects that were conducted under subcontract to Anacapa Sciences. The summary description for each project and the technical advisory service contains (a) a background section that describes the rationale for the project and specifies the research objectives; (b) a research approach section that describes the tasks and activities required to meet the project objectives; (c) a work completed section that may include research findings or, in the case of developmental activities, a description of the research products; and (d) a project status section that describes the projections for future research, if any.

TR 931 Judgments of Probability and Relative Importance in a Military Decision Scenario: The Influence of Subjective and Objective Variations in Causal Factors, Hamm, R.M. June 1991. (AD A239 935) For this report, researchers used hypothetical battle decision situations to

study military officers' judgment of probability and relative importance. For the study, 222 correspondent and 72 resident students of the Command and General Staff College read a description of one or two military situations, assessed the probability of mission success, and judged the relative importance of several situational factors. Probability judgments were insensitive to variations in the important factor of enemy strength, yet in one problem they responded to irrelevant variations in the mood of the presentation of the situation. Relative importance judgments were, on the whole, "global," that is, stable over situational changes. College students' judgments were similar to military officers' except that college students thought the missions had greater chance of success.

TR 932 Analysis of Army Family Research Program Measures of Individual Readiness, Sadacca, R.; DiFazio, A.S. July 1991. (AD A241 271)

The Army Family Research Program (AFRP) was initiated in Fall 1986 to examine the role that families play in soldier readiness. The core of the research was a large-scale survey of Army soldiers and their spouses. To determine the impact of family and Army factors on readiness, it was necessary to identify one or more reliable measures of individual readiness. Candidate individual readiness measures or dimensions were initially identified through a review of the military readiness literature. A set of 12 behaviorally anchored readiness scales were developed from critical incidents collected from field grade officers and senior NCOs. In addition, a number of other readiness measures were developed by the project team. Factor analyses of the readiness measures were conducted, and the Alpha reliabilities of alternate readiness composites were obtained. The 12 readiness scales were found to constitute a single factor. The most reliable measure of readiness was the average of the first- and second-level supervisory ratings on

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these scales. Adding other measures of readiness lowered the reliability of the composite and led to problems comparing scores. The measure of individual readiness adopted by the AFRP can be used in further readiness research or to measure soldier readiness operationally.

TR 933 Economic Returns to Military Service, Andrisani, P.J.; Daymont, T.N. July 1991. (AD A241 132) This research assesses the economic returns to military service by examining the impact of service on in-service and post-service earnings. It extends the authors' previous research in several ways. First, it builds an extensive literature review on the subject since our research was completed. The review focuses on techniques of measuring the economic returns to military service. Second, it adjusts the earnings equations for self-selection bias. Third, it extends our earlier analysis and model development to female veterans and nonveterans, where the theoretical, empirical, and econometric issues are not precisely analogous to those for men. Fourth, it uses the most military data available from the National Longitudinal Surveys of Youth.

TR 934 Junior Army Officer Retention Intentions: A Path Analytic Model, Teplitzky, M.L. July 1991. (AD A242 094) This research tests a model of the determinants of retention intentions in a sample of recently commissioned (1984-1987), married, male, junior Army officers. Four variables—perceived Army career prospects, organizational identification, anticipated work/family conflict, and years of services—were specified as direct determinants of propensity to stay in the Army. Five additional variables (person/branch match, prior career orientation, current work satisfaction, operational support, and inspirational leadership) were hypothesized to have indirect effects on retention, operating through their influence on

career prospects and identification. The predictions of the model were largely supported. Organizational identification had strong positive effects, and work/family conflict had strong negative effects on propensity to stay. Perceived career prospects and years of service also had significant, although smaller, positive effects. In combination, the direct determinants accounted for half of the variance in the dependent variable. Of the four antecedent variables predicted to influence Army career prospects, three had significant path coefficients (branch match, work satisfaction, and operational support received). All three variables hypothesized to affect organizational identification were significant (prior orientation toward a military career, operational support, and inspirational leadership), but they explained little (18%) of the variance in identification. The omitted parameters test indicated that the model underestimated the importance of current work satisfaction, which had small direct effect on intentions in addition to indirect effects through both intervening variables. In addition, results suggested that possible causal relationships between work/family conflict and organizational identification and career prospects need to be examined in future research.

TR 935 Development of a Prototype of an Army Model Exit Survey, Griffith, J.E.; Greenlees, J.B.; Steele, D.M.; Stewart, N.K. July 1991. (AD A251 875) This project was part of a larger research program on downsizing the U.S. Army. The program, sponsored by the U.S. Army Research Institute for the Behavioral and Social Sciences, included a review of downsizing literature, analysis of existing data bases for information on downsizing, and surveys assessing the impact of force reduction on Army personnel and their families. This project required development of a prototype survey to assess transition needs of soldiers involuntarily separated from the Army because of downsizing. Key in-

formants provided information on past and current exit surveys, transition services currently offered by the military, the needs of separating soldiers, and criteria to evaluate transition services. Past and current exit surveys were reviewed, but they provided little guidance in assessing the transition needs of involuntarily separated soldiers. Literature on job loss in the civilian workplace provided more relevant information on the issues and needs of workers who experience involuntary job loss and an organizing framework of important concepts and variables pertinent to involuntary job loss. Site visits with transition staff, separating soldiers, and spouses of separating soldiers validated the organizing framework. A pretest was conducted on a sample of 179 soldiers representative of those separated from the Army who were outprocessing at three Army posts. Pretest data suggested improvements to the form, such as reformatting a content area, reordering response categories, and rewording instructions. Although inferences were limited due to the nature of the sample, the data were used to examine a priori hypotheses about the transition needs of exiting soldiers. Analyses suggested that involuntarily released and dishonorably discharged soldiers would benefit more from transition services aimed at finding jobs at short notice than would other separated soldiers, and that soldiers assigned outside the continental United States were in greater need of transition services than were soldiers assigned within the United States. The final optical mark-sense readable survey form incorporated changes based on the results of the pretest and on suggestions made by the contracting office.

TR 936 Early Training Strategy Development for Individual and Collective Training, Meliza, L.M.; Knerr, B.W. August 1991. (AD A242 753) The training strategy for a new weapon system identifies the training devices required, the tasks each

device will be used to train, and the circumstances under which each device will be employed. Consideration of embedded training (i.e., use of operational equipment and training software to provide training) as the first option for new weapon systems forces early development of training strategies. Training development tools, such as the Optimization of Simulation-Based Training System, are available to support development of a training strategy, but an overall model is needed to show how the various tools can be integrated to support strategy development. This report describes a high-level model for early training estimation that incorporates other training development tools. The benefits of this model include integration of individual skills training across duty positions, individual skills training with collective training, collective task training across unit missions, and collective task training across echelons.

TR 937 The Development and Evaluation of a Job Aid to Support Mobile Subscriber Radio-Telephone Terminal, Hall, K.K.; Legree, P.J.; Gillis, P.D.; Chance, D.; Sanders, M.G. August 1991. (AD A243 228) The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) developed a job aid to support operation of the Mobile Subscriber Radio-Telephone Terminal (MSRT) by non-Signal soldiers. The Army Technical Manual (TM), the job aid, and a demonstration were evaluated to determine their effectiveness in enhancing the operation of the MSRT by non-Signal soldiers. Two groups of non-Signal subjects attempted to operate the MSRT using the job aid, one group with the benefit of a short demonstration, and the other group without a demonstration. Group comparisons indicate that the job aid enhances performance more than the TM, and that the demonstration further enhances performance. These findings demonstrate that the job aid will be beneficial in reducing training costs and time.

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TR 938 The Effects of SIMNET Role-Playing on the Training of Prospective Platoon Leaders, Shlechter, T.M.; Bessemer, D.W.; Kolosh, K.P. November 1991. (AD A224 913) This investigation examined the relative value of having prospective armor platoon leaders engage in role-playing activities while using the Simulation Networking (SIMNET) training simulator. Training records were examined for 470 students in Armor Officer Basic (AOB) classes from late 1988 to mid-1989. During the SIMNET training exercises, 123 (26.2%), 115 (24.5%), 194 (41.8%), and 38 (8.1%) of these students acted as platoon leader, platoon sergeant, tank commander, and driver/gunner/loader, respectively. Regression analyses were performed on the measures obtained from course records. The results demonstrate that being in a platoon leadership position during SIMNET training leads to the highest performance evaluations. These findings imply that AOB students should have direct experience in platoon leadership positions during their SIMNET training.

TR 939 Capturing Temperament Constructs with Objective Biodata, Mael, F.A.; Schwartz, A.C. November 1991. (AD A245 119) The purpose of this research is to develop biographical data (biodata) indicators of attrition and leadership potential and performance that can measure relevant temperament constructs suitable for an admissions package at the U.S. Military Academy (USMA). The Army temperament measure Assessment of Background and Life Experience (ABLE) and a 73-item biodata instrument were administered to 1,325 incoming USMA cadets in July 1990. The biodata items were used to produce analogs to five ABLE scales. The relationship of the ABLE scales and their biodata analogs to three criteria (attrition from 6-week summer training, leadership ratings from the 6-week period, and leadership ratings from fall semester) and the incre-

mental contributions of ABLE and biodata analogs beyond the current USMA Whole Candidate Score (WCS) were evaluated. Results demonstrated that the biodata scales showed strong relationships to their equivalent ABLE scales and comparable relationships to the criteria in 13 of 15 comparisons. Also, for each criterion, either overall ABLE or the biodata equivalent added incremental validity over and above the WCS. Five of the six biodata scales had significantly smaller correlations with a social desirability scale than the equivalent ABLE scale. The results demonstrate the potential role of a biodata measure in an admissions package as a versatile indicator of attrition and leadership ability.

TR 940 Analyzing and Adjusting for Non-response to the AFRP Spouse Survey, Iannacchione, V.G.; Milne, J.G. November 1991. (AD A244 812) This report presents a detailed analysis of the reasons for failure to respond to the AFRP Spouse Survey and describes the procedures used to minimize the biasing effects of nonresponse. The report summarizes the selection and implementation of the AFRP Soldier and Spouse Surveys, describes the opportunities for spouse nonparticipation, and presents the models developed to predict the probability of spouse participation. It also presents details of the nonresponse adjustments made to the spouse sampling weights.

TR 941 Setting Performance Standards: A Review of Related Literatures and Identification of Future Research Needs, Bobko, P.; Colella, A. December 1991. (AD A246 036) Because performance standards are used for evaluation by many organizations, this paper considers aspects of the standard-setting process that influence affective and behavioral reactions of job incumbents. Literatures used to specify future research needs and directions in the use of performance standards examined educational

standard setting, goal setting, feedback and framing, performance appraisal, utility analysis, and job satisfaction. This report outlines research suggestions (and specific hypotheses when possible) concerning the ease of internalization of external performance standards, the definitional content of standards, the difficulty levels of performance standards, and the communication of standards. Implications within the organizational context of the U.S. Army are also considered.

TR 942 Sampling Weights for the Army Family Research Program

(AFRP) Core Research Effort, Iannacchione, V.G.; Milne, J.G. December 1991.

(AD A246 292) This report summarizes the Army Family Research Program (AFRP) sample design, the distribution of AFRP participants, and the scope of the survey population. It includes a discussion of what sampling weights are, why they are needed, and how they should be used. Calculations are provided for adjusting sampling weights to compensate for potential nonresponse bias.

TR 943 Combat Vehicle Command and Control Systems: Training Implications Based on Company Level Simulations, Atwood, N.K.; Quinkert, K.A.; Campbell, M.R.; Lameier, K.F.; Leibrecht, B.C.; Doherty, W.J. December 1991. (AD A246 460)

To improve the command and control of armor units, the Army is evaluating the usefulness of including an automated command and control system on future tanks. This research evaluates the training implications for two concept configuration of the Combat Vehicle Command and Control (CVCC) system. This research, part of a larger company-level evaluation, was conducted using the Close Combat Test Bed (CCTB) at Fort Knox. Two hundred ninety-four armor soldiers (56 commissioned officers, 85 noncommissioned officers, and 153 enlisted men) participated in the research over a 14-week period. During each 5-

day data collection period, seven manned simulators (with three-man crews plus auto-loader) and six semiautomated vehicles formed a tank "company." The results of this research and development effort suggest investigating additional CVCC concept configurations and extensions of the CVCC concept to the battalion level. Findings also provide information on the training requirements associated with new equipment should the CVCC system be fielded.

TR 944 Command Vehicle Command and Control Systems: III. Simulation-Based Company Evaluation of the Soldier-Machine-Interface, Ainslie, F. M.; Leibrecht, B.C.; Atwood, N.K. December 1991. (AD A246 237)

To improve the command and control of armor units, the Army is conducting research and development on automated command, control, and communication for future tanks: the Combat Vehicle and Control (CVCC) system. This research investigates the extent to which the CVCC soldier-machine interface (SMI) supports the soldier's ability to learn and effectively operate the system. For the research, 105 U.S. Army personnel participated in 5 weeks of training and testing. Automated measures of equipment use and subjective assessments indicate that, overall, the CVCC is a useful and usable system that participants feel will improve their performance. Problems with usability were noted for select functions. Recommendations for improvement focus on providing alternative input methods, enhancing the digital report function, and improving feedback to vehicle commanders and drivers.

TR 945 The Determinants of Child Care Use and Retention in the U.S. Army, Lakhani, H.; Ardisson, S. December 1991. (AD A246 161)

This report examines the use of Army child care facilities and their impact on spouses' desire for retention and career plans of soldiers. Data from the Annual

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Survey of Army Families, 1987, for officers ($n=2,000$) and enlisted ($n=5,000$) spouses are analyzed. The results reveal that child care use increases with an increase in (1) spouse employment, (2) soldier rank, (3) volunteer time spent in military or civilian organizations, and (4) number of months spent at location. Enlisted soldiers use more informal care, such as baby sitting, and officers use more formal care, such as child development centers (CDCs), perhaps because the former cannot afford to pay the fees for the CDCs. The spouses' desire for soldiers' retention increases with an increase in (1) child care used, (2) spouses' satisfaction with Army life, (3) number of dependent children, (4) soldier's age, (5) number of months at current location, and (6) soldier's total years of service.

TR 946 Career Intentions and Behavior of Army Officers: A Model Testing Approach, Guthrie, T.J. January 1992. (AD A246 291) This report examines the relationship between attitudinal factors related to career intentions and behavior of company-grade Army officers. The research tests the adequacy of the two theories that address the relationship between intention and behavior: the theory of reasoned action and the theory of planned behavior. Officer data from the 1988 administration of the Longitudinal Research on Officer Careers (LROC) survey of officers commissioned from year groups 1980 to 1987 provided data on attitudes toward staying in the Army and subjective norms. Separation behavior through 1990 from the Officer Longitudinal Research Data Base (OLRDB) was matched with the 1988 LROC survey data. The results supported the application of models of both theories to Army officers. Attitudes toward staying in the Army and subjective norms involving the Army were positively related to intentions to stay. Career intentions and retention behavior were strongly related.

TR 947 Improving Classification Efficiency by Restructuring Army Job Families

Johnson, C.; Zeidner, J.; Leaman, J. March 1992. (AD A250 139) This report presents one of a series of studies designed to improve classification efficiency by applying principles of differential assignment theory. The major objectives of this study are to examine classification efficiency as a function of the number of job families and to examine alternative methods for clustering or forming job families. Factors investigated include alternative methods for constructing assignment variables or predictor composites; the effects of using a more economic criterion, size, and heterogeneity of the test battery from which assignment variables are formed; and the size of analysis samples used to form assignment variables. This study presents further evidence strongly supporting the principles of differential assignment theory and suggests a number of operational steps that should be implemented to permit effective personnel classification.

TR 948 The Effects of Easy-to-Difficult, Difficult-Only, and Mixed-Difficult Practice on Performance of Simulated Gunnery Tasks, Bliss, J.P.; Lampton, D.R.; Boldovici, J.A. April 1992. (AD A251 866) The purpose of this report is to compare the effects of practicing easy-to-difficult, difficult-only, and randomly ordered, mixed-difficulty training exercises. The experimental task required tracking and shooting moving targets with TOPGUN, which is a tank-gunnery training device. Each of three groups of 20 undergraduates practiced three blocks of 36 exercises under one of three conditions: (1) easy-to-difficult progression of exercises, (2) all difficult exercises, or (3) randomly ordered, mixed-difficulty exercises. All groups were tested on 36 randomly ordered, mixed-difficulty exercises immediately after training. Dependent variables were target hits, aiming error, and time to fire. Results were that (1)

learning occurred during practice; (2) mean differences among the groups' test scores were not statistically significant; (3) the group that practiced the easy-to-difficult progression and the group that practiced the randomly ordered, mixed-difficulty exercises hit significantly greater percentages of easy targets during testing than did the group that practiced only difficult exercises; and (4) the group that practiced the easy-to-difficult progression hit significantly greater percentages of difficult targets during testing than did the group that practiced the randomly ordered, mixed-difficulty exercises.

TR 949 The Effects of Differences Between Practice and Test Criteria on Transfer and Retention of a Simulated Tank Gunnery Task, Lampton, D.R.; Bliss, J.P.; Meert, M. April 1992. (AD A251 867) This report evaluates manipulation of the difficulty of practice criteria, relative to test criteria, as a method of improving performance on track-and-shoot tasks. The experimental task required manual tracking with the Videodisc Gunnery Simulator, a tank-gunnery training device. Each of the three groups of 15 male under graduates practiced under one of three conditions in which the accuracy criterion was easier than, more difficult than, or the same as the transfer and retention test criterion. Each accuracy criterion was defined as the percentage of the target area scored as a kill when hit. Dependent variables were target kills, aiming error, and time to fire. Results suggested a speed/accuracy trade-off: Compared with a control group that practiced and was tested with the same criterion, practice with an accuracy criterion more difficult than the test criterion yielded greater hit percentages, but slower firing times. This trend, although not statistically significant, held for transfer and retention scores. Practice with an easier criterion did not result in systematic differences from the performance of the control group.

TR 950 Combat Vehicle Command and Control Systems: I. Simulation-Based Company Level Evaluation, Leibrecht, B.C.; Kerins, J.W.; Ainslie, F.M.; Sawyer, A.R.; Childs, J.M.; Doherty, W.J. April 1992. (AD A251 917) This research evaluated the training implications, including operational effectiveness and soldier-machine interface (SMI), of a Combat Vehicle Command and Control (CVCC) experimental configuration that included the Commander's Independent Thermal Viewer and a Command and Control display. Using M1 tank simulators in the Close Combat Test Bed at Fort Knox, KY, the evaluation focused on tank company schedule that culminated in two simulated combat scenarios. One of a series, this report documents significant improvements in crew/unit performance attributable to the CVCC configuration. Companion reports address training-related findings, SMI recommendations, and performance from a tactical perspective. The collective findings provide input to the design and development of training programs for future automated command, control, and communications systems in ground combat vehicles.

TR 951 Family and Other Impacts on Retention, Griffith, J.; Rakoff, S.H.; Helms, R.F. April 1992. (AD A250 449) This report, one of a series from the Army Family Research Program, examines the impact of the Army family and other factors on whether quality soldiers intend to remain on the Army for a full career. The data for the report were obtained from a sample of 11,035 soldiers serving in 528 active-component Army units at 34 geographic locations in the continental United States and overseas. Data were collected from February through December 1989. The objectives of this report are to determine (a) soldier and family characteristics related to retention, (b) reasons soldiers enlist in the Army and their career plans at the time they enter the force, (c) changes in soldiers' career plans from the time enter the Army to the current time, and, and (d)

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how Army and family factors affect retention and career plans.

TR 952 Building and Retaining the Career Force: New Procedures for Accessing and Assigning Army Enlisted Personnel Annual Report, 1990 Fiscal Year, Campbell, J.P.; Zook, L.M. May 1992. (AD A252 675) The Career Force research project is the second phase of a two-phase U.S. Army program to develop a selection and classification system based on expected future performance for enlisted personnel. In the first phase, Project A, a large and versatile data base was collected from a representative sample of military occupational specialties and used to (a) validate the Armed Services Vocational Aptitude Battery and (b) develop and validate new predictor and criterion measures representing the entire domain of potential measures. Building on this foundation, Career Force research will finish developing the selection/classification system and evaluate its effectiveness, with emphasis on assessing second-tour performance. This first year of the project was devoted to analyzing predictor data and second-tour performance data and developing an initial model of second-tour performance.

TR 953 Motivational "Contagion" Between Squad Leaders and Their Squad Members, Savell, J.M.; Teague, R.C.; Tremble, T.R., Jr. June 1992. (AD A254 283) For this research, 49 Army squad leaders (SLs) and their squad members (SMs) provided self-report measures of their job involvement before and after a 3- to 4-month train-up for a major field combat exercise. Using that self-report repeated-measure data, the authors tested a "motivational contagion" hypothesis—i.e., that SMs and their SL influence one another with regard to their job involvement. The results of the analysis indicate that job-involvement scores of SLs are correlated with job-involvement scores of

the SMs of these SLs and that the strength of the correlation varies directly with the length of the SM-SL relationship. Also, ratings of their SL's overall leadership ability predicted the magnitude of the SM-SL correlation. Examination of SM and SL scores at time 1 and time 2 suggests that influence may have been operating in both directions. Finally, overall mean job involvement was slightly (but reliably) lower at time 2 than at time 1, both for SMs and for SLs.

TR 954 Human Factors Research in Aircrew Performance and Training: 1986-1991 Final Summary Report, McAnulty, D.M. July 1992. (AD A254 455) This report presents summary descriptions of 42 research projects and 20 technical advisory services in emerging aviation systems design, manpower and personnel programs, aviator training and aviation safety research performed by Anacapa Sciences, Inc., from 9 October 1986 to 31 December 1991.

TR 955 Predicting Table VIII Tank Gunnery Performance from M-COFT Hit Rate and Demographic Variables., Smith, M.D.; Hagman, J.D. July 1992. (AD A254 580) This report describes research efforts to determine the ability to predict Table VIII performance from Conduct-of-Fire Trainer (COFT) proficiency and tank crew Tank commanders (TCs) and gunners in 24 Army National Guard M1 tank crews completed the COFT Test of Gunnery Proficiency (CTGP) before firing Table VIII during annual training. Hit Rate, based on 22 engagements from the CTGP, correlated positively with Table VIII.

TR 956 Platoon-Level After Action Review Aids in the SIMNET Unit Performance Assessment System, Meliza, L.L.; Bessemer, D.W.; Burnside, B.L.; Shlechter, T.M. July 1992. (AD A254 909) The networking of simulators provides a

means of conducting collective training that supplements field exercises. The effectiveness of this training depends, in part, on the quality of feedback units receive during After Action Reviews (AARs). ARI developed a prototype PC-based Unit Performance Assessment (UPAS); its object was to support the conduct of AARs and provide a tool for training effectiveness research by collecting and analyzing data broadcast over the simulation network. The UPAS loads network data into a relational database patterned after the National Training Center database, and it provides menus of data summary table and graph options for examining these data. In addition, the prototype UPAS replayed exercises from a bird's-eye view over a grid map.

TR 957 Stinger Team Performance During Engagement Operations in a Chemical Environment: The Effect of Cuing, Johnson, D.M.; Silver, J.D. July 1992. (AD A254 524) For this report, 29 Stinger teams were tested wearing chemical protective clothing under conditions of MOPPO (Mission Oriented Protective Posture 0) and MOPP4 in the Range Target System engagement simulation facility. Twelve teams performed without precise cuing information, and 17 performed with precise cuing information. Measurements were recorded for engagement performance, stress, workload, and vision. Engagement performance was degraded by wearing MOPP4, but was improved with the addition of precise visual cues. Use of these cues substantially reduced the degradation from wearing MOPP4. For rotary-wing targets, cues restored engagement ranges to MOPPO levels. Reported stress and workload ratings were higher for MOPP4 than for MOPPO. Detection performance of Stinger team chiefs, both in MOPPO and MOPP4, was correlated with several measures of visual sensitivity.

TR 958 Assessment of Workload in a Field Environment: Implications for Some Unresolved Workload Issues,

Sams, M.R.; Christ, R.E. July 1992.

(AD A256 651) This report describes a study that evaluated the impact on crew workload of adding the Stingray system to the Bradley Fighting Vehicle (BFV). Four BFV crews participated in force-on-force offensive and defensive missions in a baseline BFV (without Stingray) and a BFV with Stingray. Workload was assessed through operator ratings, post-mission debriefs, video and audio recordings, and an end-of-test questionnaire. Results indicated that workload was dependent on mission type (offensive or defensive) and mode of operation (baseline, Stingray-automatic, Stingray-semiautomatic, and Stingray-manual). Crew strategies to reduce workload included reallocation of some BFV commander tasks to the BFV gunner and driver. A significant negative relationship between workload and force effectiveness was demonstrated (i.e., increases in crew workload were associated with decreases in force effectiveness). The utility of the workload measurement techniques employed in the study is discussed in terms of the practical and procedural significance of the study results.

TR 959 Toward a Theory of Adaptive Training, Boldovici, J.A. July

1992. (AD A254 903) The purpose of this report is to identify conditions under which methods of adaptive training are more efficient than practicing criterion tasks. The author used examples of tasks for which adaptive methods might be helpful, derived a notional adaptive training paradigm from the examples, critiqued the paradigm in light of research results, identified variables that change the effectiveness of adaptive methods, derived testable hypotheses about the effects of each variable, and developed algorithms for deciding whether to use adaptive training and, if so, what kind and under what conditions. Vari-

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ables to consider when deciding whether or not to use adaptive training and, if so, what kind include the salience of initiating or discriminative stimuli, the salience of maintaining stimuli or reinforcers, means for altering salience (augmenting and supplementing signal, attenuating, and masking noise), sensory mode, and the relative salience of practice and criterion stimuli.

TR 960 The Effects of Procedural Structure and Computer Support Upon Selecting a Tactical Course of Action, Fallesen, J.J.; Carter, C.F., Jr.; Perkins, M.S.; Michel, R.R.; Flanagan, J.P.; McKeown, P.E. August 1992. (AD A257 254) The U.S. Army wants its commanders and their staffs to consider a broad range of factors and to make tactical decisions quickly. The Estimate of the Situation is a standard process for teaching tactical decision making. An experiment was conducted to compare structured procedures for the Estimate to a condition where procedures were unspecified and to computer-supported procedures. The structured procedures were enforced through refresher training, written instructions, and manual job aids. In the unspecified condition, teams were explicitly instructed only to select a course of action (COA) and to justify their selection. Computer support was provided in the third condition by providing a prototype tactical data system with a spreadsheet tool for war gaming the COAs. The structured and computer-supported treatments led to significantly better justifications for COA selection than did the unspecified condition. Even though computer-supported teams had only about 2 hours of instruction, there was no difference in the quality of structured and computer-supported solutions. Most of the structured teams made arithmetic errors when comparing COAs; the computer-supported teams did not. Based on the results, future enhancements should be targeted at visualizing

and understanding battle events and projecting battle outcomes.

TR 961 Simulator Motion, Boldovici, J.A. September 1992. (AD A257 683) This review analyzes the arguments for and against using various methods of force motion cuing in land-vehicle and aircraft simulators. Research literature was reviewed and opinions were solicited from 31 authorities, 24 of whom replied. Analysis of the literature and of the reasons given by the authorities for and against the use of force motion cuing indicated the following: (1) No transfer of training data support using motion-based rather than fixed-base simulators; (2) the absence of supporting data may be due to the unknown characteristics of motion used in transfer research, safety considerations that preclude conducting definitive transfer of training experiments, and deficiencies in experiments that lead to inadequate statistical power; and (3) objective examination of the effects of force motion cuing on transfer to land vehicles and aircraft requires developing and using reliable and safe tests for assessing the performance of tasks that cannot safely be performed in parent vehicles. In the absence of transfer data demonstrating the superiority of fixed-based or motion-based simulators, analyses to identify discriminative stimuli are recommended. The report presents algorithms for deciding for which tasks the use of force motion cuing in training is likely to facilitate transfer to parent vehicles and for deciding whether seat shakers, g-seats, or motion bases are sufficient to provide discriminative stimuli for task performance.

TR 962 A Model of U.S. Army Officer Retention Behavior: Final Report, Mairs, L.S.; Mackin, P.C.; Hogan, P.F.; Tinney, R. September 1992. (AD A257 440) This report summarizes the findings of a pilot study of the determinants of officer retention behavior. Stay-leave decisions for a sample of Air De-

fense Artillery officers were modeled in an ACOL-2 (panel probit) framework. The estimation showed that the officers were sensitive to changes in civilian and military pay, as well as to the condition of the civilian labor market. Retention behavior also varies by source of commission, gender, race, and marital status. Finally, the panel probit specification confirmed that unobserved heterogeneity had significant impact. As officer cohorts age, the distribution of unobserved tastes for the military becomes truncated and retention rates rise. The study also included tests of alternative specifications for the pay variable and the size of the decision window, as well as an evaluation of the applicability of model results for a policy analysis. The model will allow Army decision makers to track the effects of changes in policy, compensation, and economic conditions on the probability that officers will stay through key career decision points. Follow-on work will include estimating the model for all officers and increasing the number of decisions modeled.

TR 963 Gender and Ethnic Effects in the 1990 Army Career Satisfaction Survey

Hay, M.S. October 1992. (AD A257 778) The 1990 Army Career Satisfaction Survey (ACSS) was developed to determine the attitudes of the Army's active duty force toward downsizing the U.S. Army. Selected items from the ACSS were analyzed to investigate ethnic and/or gender differences in soldiers' opinions and beliefs. Analyses focused on ACSS items that addressed career opportunities and intentions, perceptions of Army work and training, and attitudes toward the methods and result of downsizing. Results indicate that minority soldiers have more interest in an Army career and more confidence in their opportunities in the Army than White soldiers do. Among men, minority soldiers seem to believe that the knowledge, skills, and attitudes gained from their Army experience will have greater applicability to civilian work. This eth-

nic difference is not found among women. Regarding downsizing, minority soldiers are more optimistic about the Army's maintaining a high-quality force, but they are also more likely to believe that they will be targeted for separation.

TR 964 Family Separations in the Army

Coolbaugh, K.W.; Rosenthal, A. October 1992. (AD A258 274) This report examines the impact of separations on Army soldiers and their families and the role of Army programs in providing separation support. The data for the report are from a 1989 Army-wide survey of a probability sample of 11,035 soldiers in 528 active component Army units and 3,277 Army spouses. The report examines—

- The nature and extent of separation experienced by Army soldiers and their families.
- The nature of separation problems and worries experienced and the family characteristics of those who experience them. Enlisted personnel experience the highest rates of family separation and are the most likely to report related problems.

TR 965 Army Community Support Programs: Needs and Access Among Army Families

Devine, P.; Bullman, S.; Gaston, M. October 1992. (AD A258 719) This report examines the patterns of community support program use among Army soldiers and their spouses. The data for the report are from a 1989 Army-wide survey of a probability sample of 11,035 soldiers in 528 active component Army units and 3,277 Army spouses conducted in 1989. The report examines—

- The perceptions of program usefulness and the perceptions of Army policy impact on family members the quality of Army family programs, and the helpfulness of Army community service personnel, and
- User demographic characteristics and indicators of potential program or service need for over 30 separate Army services.

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Overall, patterns of program use vary by soldier rank and, to some extent, geographical location. All soldiers and spouses, however, believe that the Army community support services are essential to the well-being of the Army community.

TR 966 Family Patterns and Adaptation in the U.S. Army, Bowen, G.L.; Orthner, D.K.; Zimmerman, L.I.; Meehan, T. October 1992. (AD A259 880) This research supports the Army Family Action Plans by providing data and analysis on soldiers living in one of four family patterns: civilian wife marriages, civilian husband marriages, dual military marriages, and single parenthood. This is the first major investigation comparing the stresses, strengths, and adaptations of soldiers in each of these types of family relationships. The data were collected from a random sample of 11,035 soldiers in 1989. The analyses were conducted on 7,524 married and single parent soldiers in the sample. Civilian spouse marriages were examined, whether the spouse was co-located with the soldier or not. Dual military marriages included those in which both partners were on active duty. Single parents included nonmarried soldiers who had custody of children living in their households. Final analyses compared soldiers across gender and pay grades on the following variables: work stress, family stress, psychological strengths, marriage and family strengths, social and community resources, leadership support, coping and adjustment, and Army-family fit. Few significant differences emerged from the analyses of personal and family stress and adaptation of soldiers across family patterns. Significant differences, however, were apparent in the demographic characteristics associated with these family patterns; these differences may account for most of the variations by family pattern. For example, younger, junior enlisted soldiers tended to experience more stress and have more difficulty adapting, irrespective of

their type of family arrangement. Likewise, male soldiers tended to have weaker social support networks than female soldiers across all family patterns. One relatively consistent difference across family patterns, however, was the somewhat higher levels of stress and lower levels of coping among single parent males. This group of soldiers had the most consistent problems with work and family stress and adaptation. Female single parent soldiers, in contrast, had fewer problems and their experiences were more likely to mirror those of married soldiers. The findings from this research will facilitate the work of military service providers, trainers, leaders, and manpower personnel. Specific recommendations are offered to expand support program efforts to Army married and single parent families, offer more informal support to families through unit and community support organizations, increase the training given to service providers and unit leaders on family-related issues, and conduct further, more intensive research on the special needs of each type of family pattern.

TR 967 Preliminary Analysis of the Impact of Army and Family Factors on Unit Readiness, Sadacca, R.; McCloy, R.A.; DiFazio, A.S. October 1992. (AD A259 200) The Army Family Research Program (AFRP) was initiated in the fall of 1986 in part to examine the role that families play in unit readiness. The core of the research was a large-scale survey of Army soldiers and their units. To determine the impact of family and Army factors on readiness, a series of analyses was conducted to reduce the number of survey variables to a subset that more parsimoniously accounted for the observed variation in measures of unit readiness. The variable reduction was conducted through factor analyses and hierarchical multiple regression analyses. The reduced set variables were analyzed using LISREL in the framework of a simplified model of unit readiness. The results of

the analyses suggest that the most important family-related factor in unit readiness is the support unit leaders provide to soldiers and their families.

TR 968 Family Adjustment to Relocation, Croan, G.M.; LeVine, C.T.; Blankinship, D.A. November 1992.

(AD A259 392) This report examines the impact of relocation on soldiers and their families and the role of Army programs in relocation adjustment. The data for the report are from an Army-wide survey of a probability sample of 11,035 soldiers in 528 active component Army units and 3,277 Army spouses conducted in 1989. This report examines—

- The impact of relocation on families with differing characteristics and circumstances, including marital status, number of children, age of children, type of move, location and timing of move, and cumulative number of moves.
- The use and perceived usefulness of Army Programs by soldiers and families.

TR 969 Leader Development Training Needs Assessment of U.S. Army Battalion Commanders, Stewart, S.R. November 1992. (AD A259 204) This report documents a research project undertaken to identify the training needs of U.S. Army battalion commanders. Twenty-nine battalion commanders and their immediate supervisors (19) participated. Researcher used a structured interview to obtain information about the strengths and weaknesses of battalion commanders from their own perspective and that of their supervisors. Questions were also asked about "mentoring" and "life experiences" that had resulted in significant changes in outlook on life and the issues surrounding it. These questions were asked to determine the extent and nature of mentoring as a method for human resources development and to shed some light on the human development process in general. Major findings were

(1) many battalion commanders did not appear to have been conceptually prepared for the requirements of their job, (2) decentralization of control is one of the most difficult battalion and brigade command requirements, (3) risk aversion caused by high levels of insecurity leads to decentralized control, (4) failure to decentralize at battalion level may not result in disaster, but failure to do so at brigade level will, (5) battalion commanders need more preparation in how to conduct collective training than in how to conduct individual training, (6) mentoring is a poorly understood concept often confused with related activities—coaching, counseling, and sponsoring, and (7) conceptual and emotional development appear to be major and interacting components of the maturation process—they should be given equal attention in any training designed to promote human development.

TR 970 How Well Did the Combat Training Centers Prepare Units for Combat? Questionnaire Results from Desert Storm Participants, Keene, S.D.; Halpin, S.M. January 1993. (AD A260 038) In the spring of 1991, the Center for Army Lessons Learned and the U.S. Army Research Institute for the Behavioral and Social Sciences Fort Leavenworth Field Unit developed questionnaires to investigate a number of issues related to soldiers' experiences in Operation Desert Storm. One issue that was explored was the combat preparation provided by the Combat Training Centers. This report discusses the participants' responses on this issue.

TR 971 Use of Virtual Environment Training Technology for Individual Combat Simulation, Levison, W.H.; Pew, R.W. February 1993. (AD A263 546) For this research, 25 tasks and functions for dismounted soldiers were derived from Army training documents. Ten types of virtual environment technology were identified: visual display, visual sensing, auditory display, auditory

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sensing, haptic display, haptic sensing, whole-body movement, biomechanical articulation of Dismounted Infantry (DI) models, influence of physical condition on DI models, and physical condition of trainee. For each type of technology, up to three levels of capability were identified that represent anticipated availability in the near, intermediate (3-5 years), or far (more than 5 years) term. Subjective estimates were then made of the minimum level of technology required to support training of each of the tasks and functions. Although the technology that will be available in the near term does not appear to provide adequate training on all tasks and functions, it will nevertheless provide potential training and mission rehearsal benefits. Difficult problems yet to be resolved concern mission-specific training, urban and close-in operations, control and manipulation of weapons and equipment, and whole-body movement.

TR 972 Canceled.

TR 973 Development and Application of a New Approach for Classifying Errors made in Receiving Morse Code,

Kern, R.P. March 1993. (AD A264 868)

This report represents one phase of research conducted by the U.S. Army Research Institute for the Behavioral and Social Sciences on improving Morse Code acquisition skills of military Morse Code interceptors. This Morse Code training study is the first to examine performance in copying code based on response times and accuracy. For this phase of the research, a method was developed for classifying errors based on auditory characteristics of the code signals. This classification scheme was then applied to explore variations in error pattern as an indicator of slow training progress.

TR 974 Application and Validation of Workload Assessment Techniques,

Christ, R.E.; Hill, S.G.; Byers, J.C.; Iavecchia, H. M.; Zakland, A.L.; Bittner, A.C.

March 1993. (AD A264 575) This report describes the methods and procedures used, and the findings obtained from a series of eight separate studies across three Army systems; studies conducted systems and analytical methods for predicting that workload. It presents and discusses the results obtained from these studies in terms of their meaningfulness or validity for a number of different practical topic areas. Two broad-conclusions are drawn from the overall OWL program. First, this effort illustrates that it is possible to mount programs to examine research questions in the context of operational and developmental systems. Second, by emphasizing several important workload topics, this report establishes a basis for identifying future research needed for the successful application of workload methodologies.

TR 975 Selection of Personnel for Stressful Occupations: The Potential Utility of Psychophysiological Measures as Selection Tools, Heslegrave, R.J.; Colvin, C. March 1993. (AD A264 571) The Manpower and Personnel Research Division identified a requirement to assess whether selection and classification for stressful occupations could be improved. An interdisciplinary review, evaluation, and synthesis was carried out to assess the feasibility of using psychophysiological measures to select individuals resistant to stress to improve selection and classification methods for stressful occupations. To integrate this literature, a new psychophysiological model was developed in the context of current industrial/organizational practice. Researchers concluded that psychophysiological measures do have the potential to improve the selection/classification standards for stressful occupations. Three recommendations were made for future research. First, experimentation should begin to assess the validity of the proposed psychophysiological measures to predict successful performance under stress. Second, since people who

cope successfully appear to share some personality traits, research should be conducted into the personality correlates of successful task performance under stress. Third, occupations should be analyzed in terms of stress dimensions to provide a rationale for the identification of valid predictors and criteria of successful performance in stressful jobs. A demonstration study was outlined.

TR 976 Senior Leadership in a Changing World Order: Requisite Skills for U.S. Army One- and Two-Star Assignments, Lucas, K.W.; Markessini, J. April 1993. (AD A269 891) For this report, as part of a larger effort, interviews were conducted with 48 Brigadier Generals and 26 Major Generals to identify key position performance requirements. The interviews were theory-based, exploring the correctness of Stratified Systems Theory (SST) formulations about the structure of work at senior and strategic levels. Content analysis of the tape-recorded interviews provided broad support for SST. As expected, complexity of performance requirements systematically increased with increasing position grade. However, there were some inversions, e.g., the addition of installation command responsibilities to table of evaluation unit command invariably increased position complexity profoundly. The analysis explicitly focused on cognitive skills required for successful performance. In the view of incumbents, key requirements included cognitive skills (mental mapping, problem management planning/envisioning), dispositional skills/traits (dealing with uncertainty/risk taking, controlling through indirect means), interpersonal skills (networking, consensus building, getting feedback, using communications technology, interfacing effectively with the external environment, and communicating cross-culturally and precisely), and resources management (personnel and materiel). Findings at the one- and two-star level were compared with earlier findings at more senior levels.

TR 977 Cognitive and Temperament Predictors of Executive Ability: Principles for Developing Leadership Capacity, Mumford, M.D.; Zaccaro, S.J.; Harding, F.D.; Fleishman, E.A.; Reiter-Palmon, R. May 1993. (AD A267 589) This report completes phase 1 of a small business innovative research effort to measure and enhance cognitive skills. Prior research suggests that effective application of cognitive capacities is a crucial requirement for high-level organizational leadership. Skill in solving ill-defined problems is also important. Because problem situations often require novel approaches, their solutions necessitate creative input. This report describes research to identify cognitive skill and temperament factors that contribute to executive performance and to develop measures for them. A taxonomy was developed that had 13 leadership behavior dimensions related to discretionary and creative problem solving. Three validation studies of this taxonomy were conducted. Sixty-five cognitive and temperament predictors of executive ability were derived from the taxonomy and organized into 11 dimensions: general cognitive intelligence, creativity, crystallized cognitive skills, adaptability/ego resiliency, openness/cURIosity, self-awareness, achievement, need for dominance, commitment to social systems, practical intelligence, and social intelligence. Two studies of the validity of the taxonomy were done, the first using background data instruments and the second using critical incidents. The report describes this research and provides the infrastructure required for programmatic interventions targeting the development of these capacities and recommendations for follow-up research to evaluate the interventions.

TR 978 Micro Computer Feedback Report for the Strategic Leader Development Inventory, Hopkins, J.E. May 1993. (AD A273 353) This report describes the FeedBack micro computer program writ-

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ten to print reports for participants who have responded to the preliminary form of the Strategic Leader Development Inventory (SLDI). The SLDI is a self-assessment inventory enabling comparison of self-ratings on a number of positive and negative leadership dimensions with those from former superiors, peers, and subordinates. The final form of the SLDI is now being developed by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Strategic Leadership Technical Area, in collaboration with the U.S. Army War College and the Industrial College of the Armed Forces. In its present form, the Feed-Back program produces a 2-page assessment containing eight graphs for each participant, reflecting self-ratings compared with those from others. Future plans call for revision of the SLDI based on factor analysis of data obtained during academic year 1992. The revision will produce SLDI forms with fewer items and a cleaner factor structure. The revised feedback will then require modification of the code described in this report.

TR 979 A Description and Evaluation of Selection and Classification Models, Laurence, J.H.; Hoffman, R.G. June 1993. (AD A268 202) This report is part of an overall project to identify and evaluate alternative models for selecting and classifying soldiers into military occupational specialties. Tasks 1 and 2 of the project are documented in this report. More specifically, this document contains descriptions of the selection and job assignment processes in the Army, Navy, Marine Corps, and Air Force in terms of their intended design and operational reality. Subsequent to the description of current military selection and classification systems, alternative models are presented and evaluated along numerous qualitative dimensions.

TR 980 Research Prospectus for the Simulator Training Research Advanced Testbed for Aviation, Stewart, J.E.

II; Wightman, D.C.; Gainer, C.A. June 1993. (AD A268 165) The cost and complexity of flight simulators has been steadily increasing, but there is little empirical evidence that even high-fidelity simulators are effective training devices. This is especially true in the case of helicopter simulators. Training system developers opt for the highest fidelity simulators available. However, in a cost-constrained environment, military training developers must weigh fidelity and training effectiveness against cost. In the absence of research data, it is difficult to determine when high-fidelity simulation is needed and when it is not. The Simulator Training Research Advanced Testbed for Aviation (STRATA) is a research simulator designed to address issues pertaining to simulator training effectiveness and the training system complexity needed to accomplish specific training objectives. It is modular and can be reconfigured to represent different training devices with different visual, motion, cockpit, and aeromodel subsystems. This report will serve as a guidance document and program planning aid for developing more specific research plans for the simulator.

TR 981 Canceled.

TR 982 Family Adjustment of Single Parents in the U.S. Army: An Empirical Analysis of Work Stressors and Adaptive Resources, Bowen, G.L.; Orthner, D.K.; Zimmerman, L.I. August 1993. (AD A273 208) Based on a sample of 238 single parents who participated in the 1989 Army Soldier and Family Survey, this research examines the relative contributions of work stressors, family and community resources, and Army support resources to the family adjustment of single parents on active duty in the U.S. Army. Single fathers and mothers are compared across each of the variables in the analysis, and hierarchical multiple regression is used to determine the relative impact of potential stressors and resources on the family adjust-

ment of single fathers and mothers. The results from the comparative analysis indicate that single fathers are more likely to report personal and family vulnerabilities and difficulties than single mothers, including lower overall family adjustment to the demands of Army life. The regression results indicate that the adaptation of single mother and single father families to Army demands is influenced more strongly by the availability of family, community, and Army resources than by the presence of work stressors. Although important differences are found in the operation of these resource variables for single fathers and mothers, internal family strength and the perceived support of Army policies emerge as the two most important single predictors of the family adjustment of both single fathers and mothers. Based on these findings, recommendation focus on Army policies and program that encourage family strengths and provide supportive resources to families.

TR 983 Career Path Appreciation Data Reduction and Analysis, Lewis, P. August 1993. (AD A273 225) The Career Path Appreciation (CPA) is an assessment interview that theoretically gives insight into conceptual capacity. CPA interviews were conducted with 148 active-duty Army officers in residence at the U.S. Army War College, Carlisle Barracks, Pennsylvania. Each volunteered to be interviewed. The interrater reliability, based on 57 cases scored by two raters, was .81. Considering the quasiclinal nature of the assessment interview, this is highly acceptable. In addition, modest construct validity was demonstrated for the CPA Current Conceptual Capacity scores. War college instructors, who rated a substample on strategic thinking skill as demonstrated in War College seminar groups, tended to rate those who scored higher on the CPA as better thinkers than those who scored lower ($r = .57$ and $.51$ on two different thinking skill measures). Examination of individual responses to the

PHRASES task by subjects classified into four conceptual capacity levels on the basis of their investigator-rated CPA performances suggested ways to improve some of the PHRASES item sets.

TR 984 Overview of Army Tactical Planning Performance Research,

Fallesen, J.J. September 1993. (AD A273 273) Essential elements of superior war fighting include tactical planning and battle command. This report reviews research on the human dimension of tactical planning. By aggregating what is known about human styles and capabilities, the Army will be better able to enhance battle command performance. Available research is reviewed and organized into 10 categories. Individual difference research is reviewed that addresses level of expertise, rank, military student populations, and cognitive ability. Findings on the estimate procedures include failure to follow procedures, imprecise procedures, inflexibility of procedures, and excessive time demands. Management of the process covers lack of involvement of staff and commander and poor process management. Information exchange discusses problems in information use, presenting plans to the commander, and communicating interpretations. Battle success relates procedural performance to outcome measures. The other categories address the functions performed in the command and control (C2) cycle. Situation assessment reviews failures to consider factors, verify assumptions, assess information quality, interpret information, and make predictions. Formulation of alternatives includes failure to track concepts, generate alternatives, and develop contingencies. Evaluation and comparison of alternatives deals with decision-making approaches, not doing evaluations, and inadequate war gaming. Planning and synchronization covers poor planning. Enacting plans and monitoring relates findings on poor orders dissemination and battlefield tracking.

Technical Reports

TR 985-989 Canceled.

TR 990 Computerized Testing System

Software Conversion and Development: Identifying Software and Hardware Portability Issues and Solutions, Rosse, R.; Dodd, D.; Silva, J.M., ARI. October 1993. (AD A273 489) This report identifies hardware and software issues associated with the transition of computerized tests from old hardware and software configurations to currently available hardware and software. Hardware issues addressed include real-time clock performance, storage devices, video adapter, central processing unit (CPU), and CPU processing speed. Software issues addressed include conversion from PASCAL to C code and hardware-dependent routines.

TR 991 The Effect of Restoration of Field of View on Stinger Team Performance in a Chemical Environment, Silver, J.D.; Lockhart, J.M. November 1993. (AD A275 502) For this report, the authors investigated the efficacy of restoration of field of view (FOV) in improving Stinger team engagement performance in a chemical environment. Experiment 1 was a laboratory test that established that the FOV of modified M19 binoculars and a modified Stinger sight were significantly greater than those of the unmodified binoculars and Stinger sight when used with a chemical protective mask. Experiment 2 was a field test to determine the effectiveness of the modifications in improving performance. In overall comparisons among the three conditions, wearing the mask did not significantly impair performance. However, when the effects of learning the test environment are removed from the data, the results are exactly as predicted. Performance in the mask without modifications FOV condition is much worse than in the no mask and mask with modifications FOV conditions. Performance in the no

mask and mask with modifications FOV conditions is virtually identical.

TR 992 Battalion Evaluation of the Combat Vehicle Command and Control System in Distributed Interactive Simulation: Preliminary Findings, Leibrecht, B.C.; Winsch, B.J.; Ford, L.A.; Sawyer, A.R.; Meade, G.A.; Ainslie, F.M. November

1993. (AD A275 912) To meet command, control, and communications (C3) challenges of the future battlefield, the Combat Vehicle Command and Control (CVCC) research and development program evaluates automated C3 technology using soldier-in-the-loop simulation. The CVCC system includes a digital Position Navigation system, a digital Command and Control Display, the Commander's Independent Thermal Viewer, and digital workstations in the Tactical Operations Center. The battalion-level evaluation compares the CVCC system with a Baseline (conventional) configuration in terms of operational effectiveness. Soldier-machine interface (SMI) and training implications are also addressed. Using M1 tank simulators in the Mounted Warfare Test Bed at Fort Knox, Kentucky, unit commanders and executive officers with crews are integrated with semiautomated vehicles under their control to form complete tank battalions. Each battalion completes 4 days of training and testing, culminating in a simulated combat test scenario. This report presents preliminary data based on two Baseline battalions and two CVCC-equipped battalions. Improvements in the performance of unit and vehicle commanders are noted, and selected SMI and training results are discussed.

TR 993 The Glass Ceiling: Potential Causes and Possible Solutions,

Dugan, B.A.; Terner, J.L.; Tagliarini, F.A.; Bayless, J.A.; Felber, H.R.; Rigby, C.K. December 1993. (AD A278 051) Identifying barriers to advancement in its civilian workforce for women, minorities, and the disabled is a

continuing concern for the Department of the Army. This literature review focuses on three potential causes of underrepresentation of minorities and women in the management ranks; lack of data on the disabled precluded treatment of this subgroup. The three causes of underrepresentation are systemic barriers, stereotypes and biases, and group differences. Systemic barriers are widespread policies and practices that perpetuate discriminatory treatment. Stereotypes and biases are thought to underlie the belief that minorities and women are not suited for managerial jobs. Individual factors and group differences refer to the extent to which individual deficiencies, common to members of a subgroup, are responsible for underrepresentation of women and minorities in the management ranks. Based on findings in the literature, the report suggests avenues for future research on barriers to advancement within the Army and highlights methods that might reduce such barriers.

TR 994 The Interrelationships of Child-Care Use, Spouse Employment, Army Satisfaction and Retention in the U.S. Army, Lakhani, H.A.; Hoover, E. January 1994. (AD A277 677) This report analyzes the interrelationships of childcare use, the Army wife's employment/earnings, her satisfaction with Army life, and her desire for soldier retention in the Army. Data from the Survey of Army Families 1986/87 and 1991/92 are analyzed using regression equations. The results reveal that childcare use increases with an increase in the Army wife's employment and earnings and vice versa. An increase in Army wife's satisfaction with childcare use increases her satisfaction with Army life that, in turn, enhances her desire for soldier husband's retention in the Army. Since retention is increased, providing childcare services is likely to be cost-effective compared with the alternative—recruiting and training a soldier.

TR 995 Canceled.

TR 996 Principles of Design for High Performing Organizations: An Assessment of the State of the Field of Organizational Design Research, Osborn, R.N.; Baughn, C.C. March 1994. (AD A286 184) This comprehensive review of the literature on organizations and organizational design assesses the current literature and provides an integrative model of design for high performing organizations. The model is based on an analysis of current theories of organizational structure/design (including systems, ecological, emergent and strategic choice theories) and key change issues facing complex organizations (retrenchment, learning, innovation, and the development of strategic alliances).

TR 997 Evaluating the Unit Performance Assessment System's After Action Review Displays, Shlechter, T.M.; Bessemer, D.W.; Rowatt, W.C.; Nesselroade, K.P. May 1994. (AD A281 712) This research effort assessed military users' judgments about different versions of the Unit Performance Assessment System's (UPAS') performance feedback capabilities in after action reviews (AARs) for Simulation Networking (SIMNET) training. Interactive demonstrations with SIMNET training personnel and operational unit personnel were performed to determine the utility of the feedback materials generated by UPAS. Specific findings indicated that (a) the slide show method of exercise replay was preferred over an animated rerun method; (b) Battle Snapshot displays were more likely to be used than Exercise Timeline or Battle Flow displays; and (c) divergent opinions existed regarding the value of certain displays.

TR 998 Evaluation of the Combat Vehicle Command and Control System: Operational Effectiveness of an Armor Battalion, Leibrecht, B.C.; Meade, G.A.; Schmidt, J.H.; Doherty, W.J.; Lickteig, C.W.

Technical Reports

June 1994. (AD A282 727) In support of Army initiatives to meet future command, control, and communications (C3) challenges, the Combat Vehicle Command and Control (CVCC) research and development program evaluated automated C3 technology using soldier-in-the-loop simulation. The CVCC system includes a digital Position Navigation system, a digital Command and Control Display, the Commander's Independent Thermal Viewer, and digital workstations in the Tactical Operations Center. The evaluation reported here compared the CVCC system with Baseline (conventional) capabilities in terms of a battalion's operational effectiveness. Using M1 tank simulators in the Mounted Warfare Test Bed at Fort Knox, Kentucky, unit commanders and executive officers with crews were integrated with semiautomated vehicles under their control to form complete tank battalions. Each battalion completed three days of training, followed by a simulated combat test scenario. One of a series, this report documents improvements in the performance of unit and vehicle commanders by key Battlefield Operating Systems, along with lessons learned. Companion reports address training issues, soldier-machine interface findings, and performance from a tactical perspective. The collective findings help determine combat doctrine, materiel requirements, and training requirements for future automated C3 systems for mounted warfare.

TR 999 Army Reserve Force Structure Planning Model, Pienta, L.A.; Olin, G.L.; Shea, B.F.; Hunt, J.A.; Lakhani, H.A. June 1994. (AD A282 765) This report analyzes the reenlistment part of the Reserve/National Guard force structure model. Analysis of the Defense Manpower Data Center's Reserve Component surveys, 1986, Reserve Components Common Personnel Data System, and civilian moonlighting wages predicted from the Bureau of the Census reveals that the U.S. Congress can increase reenlistment

by increasing Reserve pay. Reenlistment can also be increased by assigning reservists to primary Military Occupational Specialties in which they are trained.

TR 1000 Information Management Performance for Future Platoon Leaders: An Initial Investigation, Lickteig, C.W.; Emery, C.D. June 1994. (AD A282 908) As the Army moves toward vehicle-based automated command and control (C2) systems, small unit commanders face new challenges in managing battlefield information. This report evaluates the information management performance of platoon leaders equipped with a future C2 system. Findings indicate that the number and relevance of action taken. High message volume resulted in the loss of appropriate information to superiors and subordinates and reduced awareness of battlefield space base on reported locations. Low message relevance resulted in inappropriate relays, slower message processing, and less accurate perception and comprehension of the battlefield situation. Training issues for managing information with future C2 systems are identified and an innovative method for training information management skills is demonstrated.

TR 1001 The Impact of Leader Competence and Platoon Conditions on Platoon Performance in Simulated Combat Exercises, Kane, T.D.; Tremble, T.R. June 1994. (AD A282 453) This research concerned the quality of military leadership when, at the home post or station of a unit's assignment, leaders prepared their units for deployment to combat. Hypotheses were drawn from cognitive resources theory (CRT) to examine the influence of leader-boss stress and member support on a leader's use of personal resources in simulated combat exercises. Evidence supported predictions that member support influences the relationship between leadership competence and unit per-

formance. The relationship among leader competence, leader experience, and leader-boss stress did not support CRT. Results are discussed with respect to CRT and other relevant leadership theory. Findings highlight the importance of attending to group conditions when planning intervention to enhance the effectiveness of unit leadership.

TR 1002 A Cognitive Framework for Battlefield Commander's Situation Assessment, Cohen, M.S.; Adelman, L.; Tollcott, M.A.; Bresnick, T.A.; Marvin, F.F. July 1994. (AD A283 631) Situation assessment is an essential component of battlefield planning. This report describes a cognitive framework for situation assessment, based on research in cognitive psychology and tactical planning and on interviews with command staff. The report describes the framework in terms of three key components: memory and knowledge structures; actions, goals, and values; and monitoring and regulating cognition. It defines structural constraints and modes of processing (procedural versus knowledge-based and analytic versus intuitive) in terms of these components. It describes paths through the framework, illustrating them with concrete examples based on experiences of command staff. Finally, the report discusses characteristics of proficient situation assessors. Among the knowledge structures used by situation assessors to frame situations are enemy plan structures, enemy goal structures, temporal plan execution structures, enemy planning/command and control structures, and terrain structures. Situations may be framed proactively, predictively, or reactively. Metacognitive processes test the completeness, reliability, and consistency of situation models and plans and guide the activation of additional knowledge to flesh them out, replace weak assumptions, or resolve conflict. The framework provides a foundation for improved situation assessment performance through training, materiel, computer aids,

procedures, organizational structures, or personnel selection.

TR 1003 The Downsizing of an Army Organization: An Investigation of Downsizing Strategies, Processes, and Outcomes, Cameron, K.S.; Freeman, S.J. July 1994. (AD A284 238) An investigation of downsizing in an Army organization was conducted in 1992 and 1993. The purpose of the study was to examine four questions: (1) What is the generalized orientation of this Army organization toward downsizing—convergence or reorientation? (2) What downsizing procedures and strategies are being implemented? (3) What is the impact of these strategies on organizational performance and on employees? (4) What strategies and tactics are especially effective in producing desirable results? Results revealed that the strategy developed and implemented by top managers in this Army organization was consistent with the most effective strategies used in private sector firms. Anticipating the need to downsize before a crisis occurs, downsizing based on mission and core competencies instead of headcount, redesigning and eliminating work as well as numbers of employees, and investing in human resources through training and recognition instead of thinking of people as liabilities all were among the steps implemented in this organization that match "best practices" from past research. In addition, researchers found that the organization's subunits with the lowest performance scores focused primarily on mechanisms to reduce size and decrease headcount. Subunits with the highest performance scores focused more broadly on process improvements, involvement of employees, visible and visionary leadership, broad sharing of information, and equal attention to those who stayed in the organization and those who left.

TR 1004 Creation of New Items and Forms for Project A Assembling

Technical Reports

Objects Test, Busciglio, H.H.; Palmer, D.R.; King, I.H.; Walker, C.B. August 1994. (AD A285 522) The Army's Project A was a comprehensive effort to improve the selection and classification of enlisted personnel. The Assembling Objects (AO) test was a major product of this effort. Previous research has shown AO to be an excellent measure of both overall spatial ability and complex, g-loaded problem-solving skills. In view of the great potential usefulness of the AO measure, researchers from the U.S. Army Research Institute for the Behavioral and Social Sciences examined the original test to develop precise, comprehensive item specifications. Using these specifications, they developed new draft items that were psychometrically tested in a field setting. The researchers then chose the best of the new items and combined them into three complete new forms that were further tested. Analyses showed that all three new forms displayed acceptable (or better) psychometric properties, at both the item and total score level, thus supporting the usefulness of the item specifications for creating new AO items and forms. These efforts should help to make the Assembling Objects test a valuable addition to the testing programs of the Army and the other armed services.

TR 1005 Canceled.

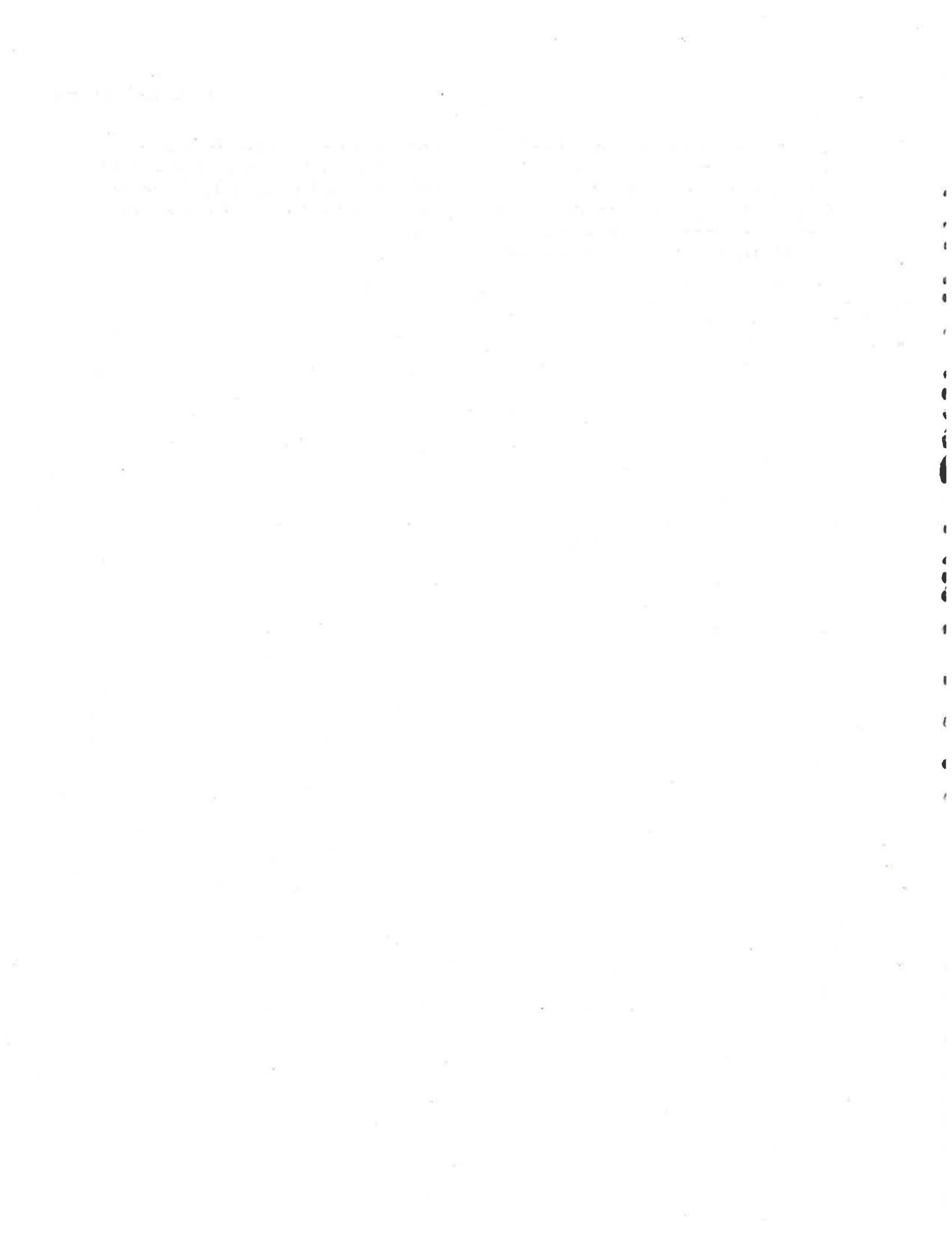
TR 1006 Training Research With Distributed Interactive Simulations: Lessons Learned From SIMNET, Bolodovici, J.A.; Bessemer, D.W. August 1994. (AD A285 584) Empirical and analytic evaluations of Simulation Networking (SIMNET) were reviewed to derive recommendations for planning evaluations of the Close Combat Tactical Trainer (CCTT). Lessons learned from SIMNET evaluations are as follows: (1) One-shot empirical evaluations of the kind performed to meet acquisition, test, and evaluation regulations are costly and unlikely to meet CCTT evaluation objectives; (2) analytic

evaluations of SIMNET produced low-cost information that can be applied to improving CCTT design and use and in budget justifications; and (3) empirical evaluation alternatives to past methods should be considered to support CCTT evaluation objectives that pertain (a) to establishing the relation between CCTT training and soldier performance in the field and (b) to complying with acquisition, test, and evaluation regulations. Evaluation alternatives were presented for CCTT, with discussions of the advantages and disadvantages of each. The evaluation alternatives included indevice learning experiments, quasi-transfer experiments, correlation of scores achieved in SIMNET or CCTT training with scores obtained during rotations at Combat Training Centers, efficient experimental designs (randomized block designs, repeated-measure Latin squares, and analyses of covariance), quasi-experimental designs, improved methods for documenting training, and analytic evaluations. Recommendations included (1) Evaluations should address how the CCTT complements or supplements existing training alternatives to support and implement Combined Arms Training Strategy while remaining within contemporary and future budgetary limitations; (2) CCTT evaluation should be a part of a larger program of Total Quality Management (TQM) applied to the Army training system and directed toward continuous improvement in training; and (3) the CCTT evaluation process should be incorporated as a continuous part of the TQM process.

TR 1007 Training and Soldier-Machine Interface for the Combat Command and Control System, Atwood, N.K.; Winsch, B.J.; Sawyer, A.R.; Ford, L.A.; Quinkert, K.A. August 1994. (AD A285 677) Shifts in the global balance of power, coupled with increasingly powerful technologies and systems, will bring unprecedented changes to the battlefield of the 21st century. In anticipa-

tional database management system tied to data summary graph and table editors. This report describes testing and refinements in the UPAS. We implemented new data filtering systems, created new data types displays, modified data displays, improved user inter-

faces in response to feedback from trainers. The findings of this research provide input for the design of feedback systems for future applications of distributed interactive simulation (DIS).



Index of ARI Publications

Abbreviations

RN Research Note
RP Research Product
RR Research Report

SN Study Note
SR Study Report
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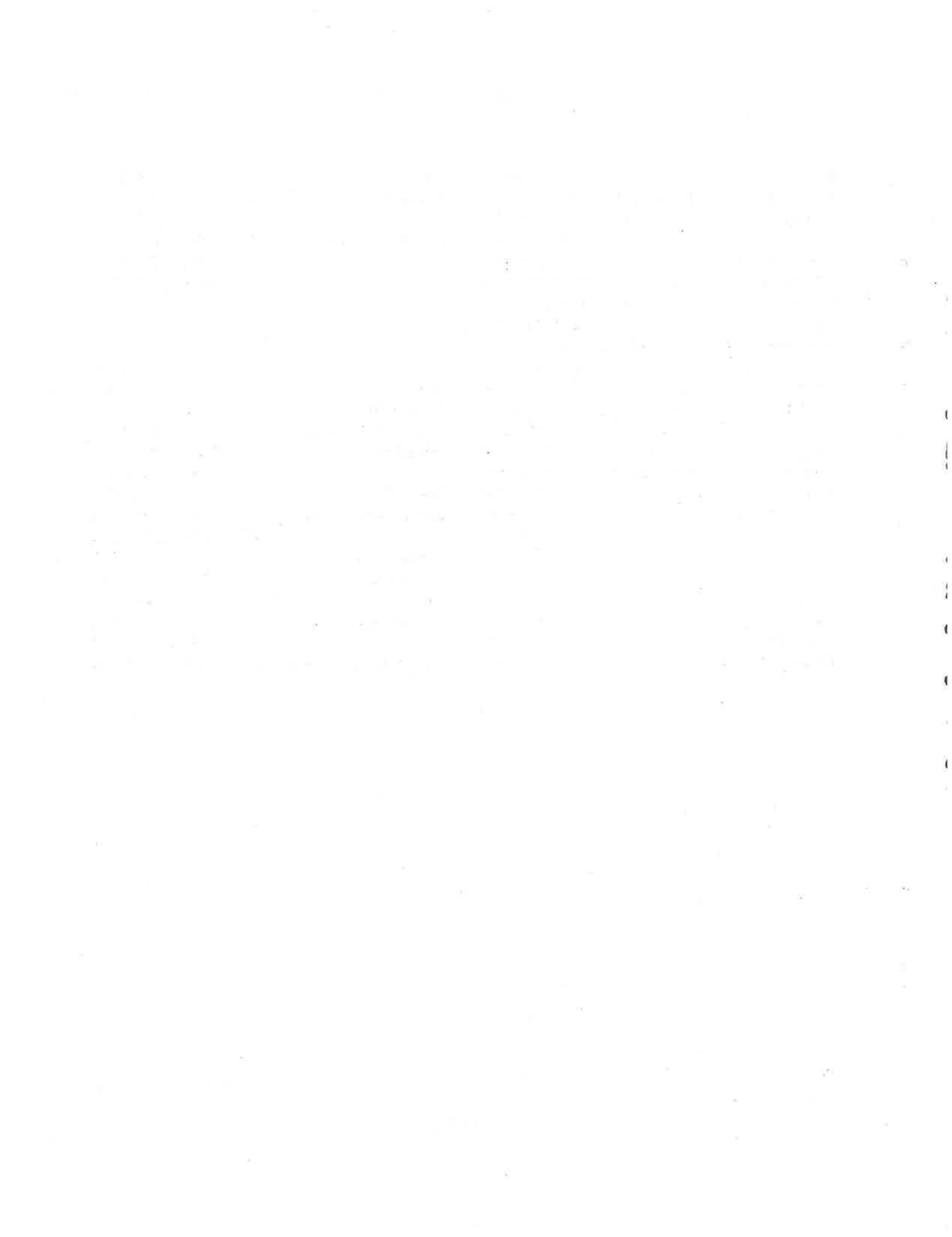
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